ELECTRICAL REVIEW

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The Load Curve

How "Staggering" Schemes are Operating

IN view of the critical economic situation, steel shortage and needs of export, the Government has decided that the risks of load shedding resulting from curtailment of the generating plant programme must be accepted. Electrical engineers, having given warning of the possibly grave consequences of this step, now have the task of making the most of their resources by speeding the installation of new plant and operating it, so far as they can, to mitigate the effects of the deficiency.

Lessons to be Learned

The cuts proposed in the White Paper (reported by us last week) do not affect plant to be installed before 1950, but examination of present daily load curves will reveal the position in relation to expedients such as load spreading, and may suggest further ways of improving load factor from now onwards. The national load curves reproduced on page 886 show a pronounced early evening peak, a notable increase in night load and a lengthening of the heavy demand period in the later evening. The regional load curves manifest considerable individual divergences from the national, the proportion of night load to the peak ranging from under 25 per cent to nearly 40 per cent, with appreciable variations in the dip from noon to about 3 p.m. as well as in the peak.

No doubt the shape of these curves and of plant-load duration curves will be modified with sustained cold weather and with dark days. Thus early this year morning "humps" on the worst days of load shedding would have exceeded the evening peaks had the plant been available, with accompanying drops in frequency and voltage which have been almost negligible so far this year. In normal circumstances from 4 to 6 p.m. appears likely to remain as the danger time in most areas, and anything done to transfer load then will materially help.

According to our latest information the position has shown steady improvement. In the beginning of November, allowing for differences in temperature and other variable factors, apart from the late peak, the saving was of the order of 12 per cent in the industrial demand. In a more recent week, the maximum demand was less than 1 per cent above that of last year although the kWh sent out increased by nearly 5 per cent. Night load was 500,000 kW more, the whole effect being that of transferring between 750,000 and 1,000,000 kW from the peaks.

Staffs' Task Eased

Another welcome feature is the more gradual rise in the demand between 7 and 8 a.m. In addition to easing the grievous strain on the system-control and power-station staffs, this tendency reduces the risk of shedding which exists even when generating capacity is nominally adequate, since there are practical limits to the rate of response of the plant to rapidly increasing loads.

Difficulties of this nature are to be expected for a number of years. A deficiency of 824,000 kW is expected in 1951-52, and the proposal to restrict

annual instalments of new plant after 1949 to 1,500,000 kW will, we fear, progressively widen the gap. In coping with these adverse circumstances, electricity supply engineers will do their share or more, while the will to co-operate among industrialists is demonstrated by the changing load curve. Further improvement will depend largely on domestic and other non-industrial consumers.

Coal Grading

As a preliminary step towards devising an equitable price structure for coal, which formed the subject of our leading article on November 28th, the standardizing of size is essential. Present practice in sizing and nomenclature varies widely from district to district. The National Coal Board has done well to adopt the recommendations of the report on the subject drawn up by the British Colliery Owners' Research Association. In this, after large coals with only a lower size limit and seven groups of graded coals, come " smalls " with an upper limit only. These are described in terms of their treatment and size and shape of screen aperture, the importance of " fines " content being emphasized.

Contracting Industry Agreement

IN this issue we give particulars of a new agreement on bonus and wages which takes effect in the New Year in the electrical contracting industry. Working hours are to be reduced from 47 to 44 but the hourly rate of pay is so adjusted as to bring the total weekly wage above the former level. In the London area (recently extended to a 15-mile radius), for instance, the standard weekly wage for the 47-hour week worked out at 129s.; under the new arrangement the pay for a 44-hour week will be 135s. 8d.; in both cases the temporary addition of 9d. per hour is included.

London Undertakings

CONSIDERATIONS arising in connection with the future of the Incorporated Municipal Electrical Association also apply to a limited extent to the Conference of London municipal undertakings. Both organizations wish to survive in some form and proposals are afoot to secure that end. Local authorities will have the largest representation upon the proposed Consultative Councils, and it would be useful to the Minister of Fuel and Power to have coherent views on the subject from organizations fully acquainted with the various aspects of electricity supply. As property owners the members of the Conference have had something tangible to protect against the possibly prejudiced actions of some of the "overall" London authorities. When they lose their undertakings they will be in much the same position as the generality of members of the I.M.E.A., to which most of them belong. In these circumstances reconstitution of both bodies may appear unnecessary in official eyes as tending towards a multitude of counsellors.

Over-Centralization Risks

IN the House of Lords last week Lord Lindsay proposed the appointment of a Government commission to inquire into the problems of devolution and decentralization in nationalized industries. General control should be accompanied, he said, by small units in which responsible decisions could be made. Viscount Swinton expressed fears of too-rigid central control of the transport system, saying that the six boards were merely " regional functionaries who were to do what they were told by Whitehall." So far as the electricity supply industry is concerned, we are relying on the promise of Lord Citrine, chairman of the British Electricity Authority, that the Area Boards will be autonomous, subject to general guidance. The Area Boards, in turn, should allow a measure of local " flexibility."

Ministerial Interference

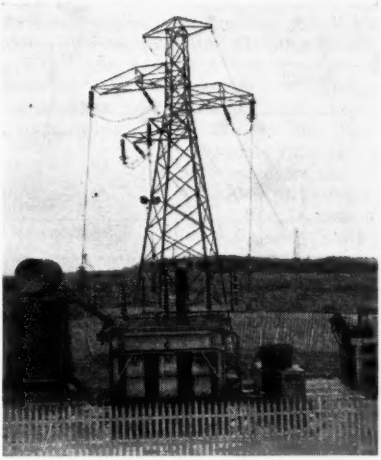
ANOTHER aspect of nationalization was raised in the House of Commons last week when Mr. Sharp asked on what principles replies would be given by Ministers to questions regarding the working of socialized industries. This gave Mr. Herbert Morrison an opportunity to enunciate a policy which may not please " snipers " at these industries for it suggests that the Government does not intend to allow Parliamentary inquirers to attempt to compel Ministers to interfere with the day-to-day operations of the industries concerned. Opportunities of discussing the work of the boards would arise, Mr. Morrison said, when their annual reports and accounts were laid before Parliament.

Supply in a Large Works

Unique Distribution Scheme

EVERY factory distribution scheme is unique when considered solely in the light of its location aspects. In recent years, however, mainly because of the war requirements, factory distribution systems have tended to become more and more standardized in regard to both lay-out and equipment, and it is therefore refreshing now and then to find a system which has major unique features for reasons other than its situation.

Such a distribution scheme is that at the chemical factory and oil refinery run by Trimpell, Ltd., at Middleton, near Morecambe, Lancs, which we have recently referred to in an article in the *Electrical Review* of November 21st, 1947, describing the electrical applications to the production processes. There are unique features in this case pertaining to the special lay-out of the factory plant; to the large factory site area of 300 acres, resulting in the installation of over 185 miles of cable; to the unusually wide range of demands in different parts of the factory, involving motors varying in size from ½ h.p. to 1,900 h.p.; to the large overall demand under wartime conditions of 250 million kWh per year; to the widely varying production conditions throughout the factory, calling for fully flameproof equipment in some parts and normal standard equipment in others, and variations of these classes of equipment elsewhere; to security measures consequent on the fact that the factory was built essentially for wartime conditions; but, above all, we think, to the design of the installation with regard to the scheme of segregation by which individual sections are separate from the 132-kV supply point down to the points of usage at 11 kV, 3·3 kV, 400 V and 230 V.



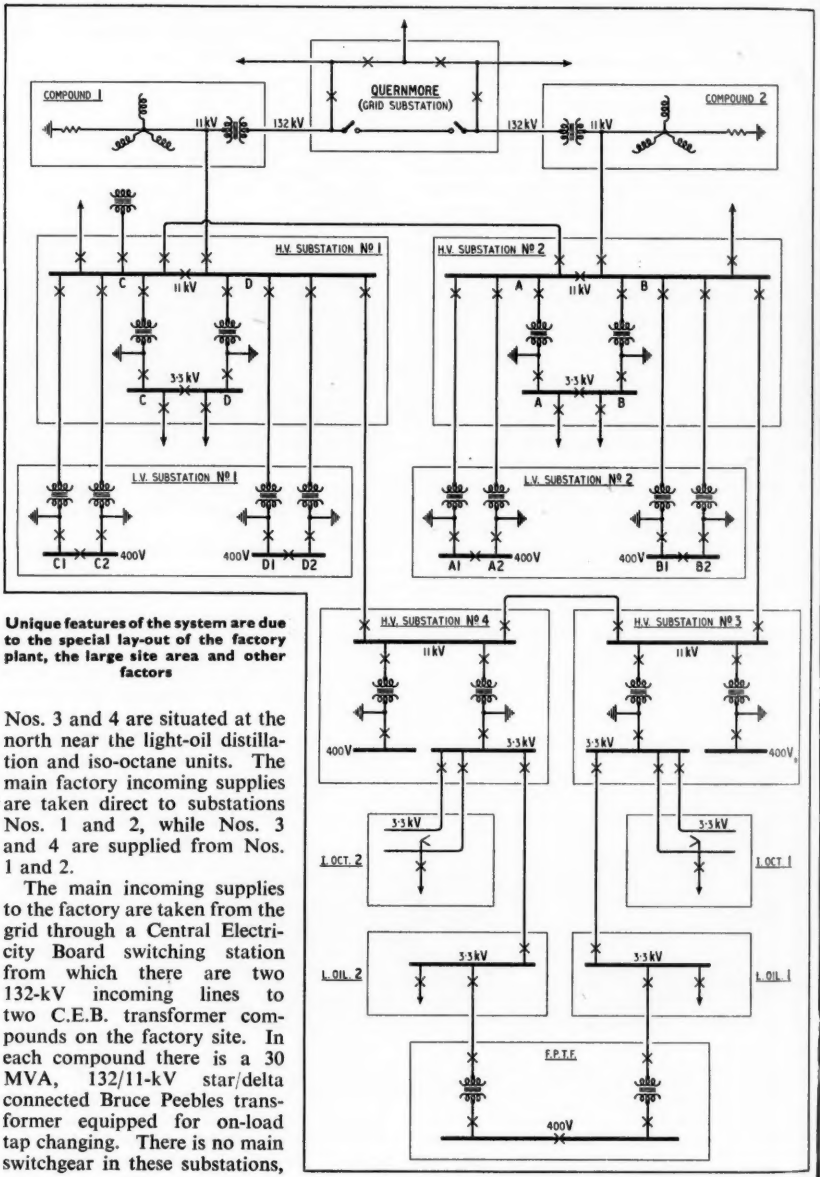
There are two incoming supplies to two factory 30-MVA transformer compounds

Consequent on the varied supply conditions, each of substations 1 and 2 is really a substation group ; e.h.v. substation and transformer compound (inside) on right—l.v. substation with transformer compound (inside) on left

The factory site is irregular, tending to be pointed at the north end and broad at the south end and centre. The refinery, with the light-oil distillation and iso-octane units, is at the north end; centrally disposed are the boilers, gas generators, oxide boxes and the main compressors; while at the south end are the hydrogenation stalls.

The essential feature electrically governing the system lay-out is the siting of the two primary and two secondary main factory substations, or substation groups, at selected load centres. The primary substations Nos. 1 and 2 are situated

at the south near the large compressors and the stalls, and the secondary substations either on the 132-kV side or on the 11-kV side. In each compound there are also an



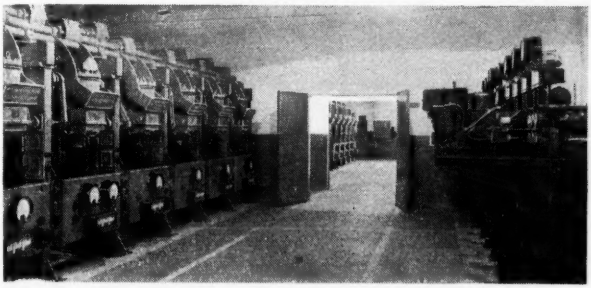
Unique features of the system are due to the special lay-out of the factory plant, the large site area and other factors

Nos. 3 and 4 are situated at the north near the light-oil distillation and iso-octane units. The main factory incoming supplies are taken direct to substations Nos. 1 and 2, while Nos. 3 and 4 are supplied from Nos. 1 and 2.

The main incoming supplies to the factory are taken from the grid through a Central Electricity Board switching station from which there are two 132-kV incoming lines to two C.E.B. transformer compounds on the factory site. In each compound there is a 30 MVA, 132/11-kV star/delta connected Bruce Peebles transformer equipped for on-load tap changing. There is no main switchgear in these substations,

11-kV/400-V earthing and auxiliary transformer, and an 11-kV neutral earthing resistance, for providing and earthing the star point on the 11-kV side.

The incoming C.E.B. feeders are equipped, in addition to the normal grid feeder protection, with reverse power relays operating in conjunction with overload relays which prevent the transfer of heavy loads from the grid lines via the factory system. Each C.E.B. compound supplies one of the primary main substations by means of nine single-core 0·75-sq in. l.c. underground cables which connect directly with the 11-kV switchgear in the appropriate primary main substation.



11-kV switchgear (left) and 3·3-kV switchgear (right) in substations Nos. 1 and 2 are each segregated with a central section switch

Generally speaking, throughout the factory motors of up to 100 h.p. are supplied at 400 V, those from 100 to 1,000 h.p. at 3·3 kV, and those above 1,000 h.p. at 11 kV. This selection scheme is based on the distances over which transmission to the motors is required, on the costs of transformation and cabling, and on the practices of the manufacturers in this respect. Consequently the twelve 1,900-h.p. compressor motors and the six 1,050-h.p., CO_2 pump motors are supplied direct at 11 kV from Nos. 1 and 2 substations, while the preheater fans, copper liquor injectors, gas-plant blowers, and other compressors are supplied direct at 3·3 kV from Nos. 1 and 2 substations, while other 11-kV feeders from the substations serve the smaller motors on the 400-V distribution system via transformers.

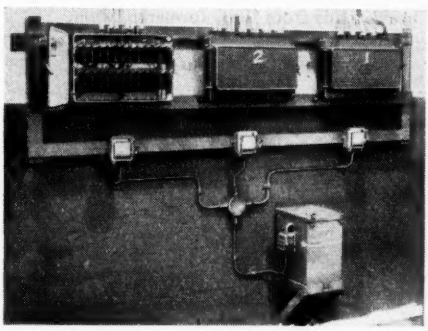
Consequent on these requirements each of the substations Nos. 1 and 2 is really a substation group, consisting of two brick and concrete buildings, one housing the 11-kV and 3·3-kV switchgear, and the other having the 400-V switchgear. A concrete-covered annexe to the high-voltage switchroom accommodates the 11-kV/3·3-kV transformers, while an annexe to the low-voltage switchroom accommodates the 11 kV/400-V transformers. The overall lay-out is such that the switchrooms are on the outside of the group with the transformer compounds situated in the centre.

The 11-kV incoming and outgoing switchgear, including a busbar section and an interconnecting switch in each case, is G.E.C. single busbar (condenser-bushing type) vertical-isolating solenoid-operated equipment, with a rupturing capacity of 500 MVA. The 11-kV interconnector between substations Nos. 1 and 2 is normally operated "closed," so that if one C.E.B. incoming line is put out of operation the other line will carry the factory load. This interconnector is equipped for McColl circulating-current protection, which ensures speedy tripping of the circuit breakers in the event of an interconnector fault.

Low-voltage main feeders are taken to unit fuse boards (right) and, in turn, to subsidiary distribution boards in the hydrogenation section

The switchgear is segregated with the busbar section switch in the centre, the section switch and the switchgear wing on either side of it being separated by brick partition walls equipped with fireproof communicating doors. The main 11-kV cables are generally not less than 0·2 sq in. conductor size and are three-core p.i.l.c. single-wire-armoured. Generally these 11-kV and other outgoing feeder switches are equipped for inverse time-limit, overload and earth-leakage protection.

From each section of the 11-kV switchgear in both the substations Nos. 1 and 2 is served an 11-kV/3·3-kV, 3,000-kVA Yorkshire Electric transformer. Each transformer serves a section of the 3·3-kV switchgear which is housed in the same room as the 11-kV gear, and it is segregated in precisely the same way. The two lines of switchgear are arranged on either side of the room in facing positions. The 3·3-kV Reyrolle switchgear has a rupturing capacity of 50 MVA.



For supplying production instruments from the power system, distribution boards are served by 400/230-V transformers fed from the power system

At one end of each high-voltage switchroom is a control room equipped for remotely controlling the 11-kV and 3·3-kV transformer and bus-section switch equipments, housing the C.E.B. operating and metering boards and the synchronizing pedestal, etc. The operation of the main 11-kV system is carried out by the e.h.v. system switchman who is normally stationed at the No. 2 substation. He is in communication with the C.E.B. district control engineer regarding the operation of the C.E.B. 11-kV feeders, and among other duties for which he is responsible are the switching operations for starting the 11-kV motors.

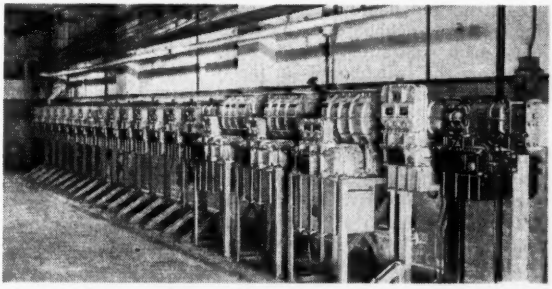
From the 3·3-kV switchgear in these substations is fed the 3·3-kV distribution network which consists generally of 0·06-sq in. conductor three-core p.i.l.c. single-wire-armoured cables. Also from each section of the 11-kV switchgear in each of the substations Nos. 1 and 2 (i.e., sections A, B, C and D) are supplied two 1,500-kVA, 11-kV/400-V English Electric transformers; thus there are two 400-V transformers supplied from each side of the busbar section switch, or four transformers of this ratio from each of the substations Nos. 1 and 2. Each pair of these transformers from one of the 11-kV sections serves the 400-V, 25-MVA rupturing capacity Reyrolle switchgear in one of the low-voltage substations, but in each case the two sections of low-voltage switchgear are separated by a busbar section switch.

The two substations Nos. 1 and 2 are identical. Thus for the southern part of the factory there are eight 400-V distribution sub-systems served from A1, A2, B1, B2, C1, C2, D1 and D2, 400-V switchgear sections. A1 and A2 are served from one section of the 11-kV switchgear in No. 2 substation, and B1 and B2 are served from the other section of the 11-kV switchgear in the same

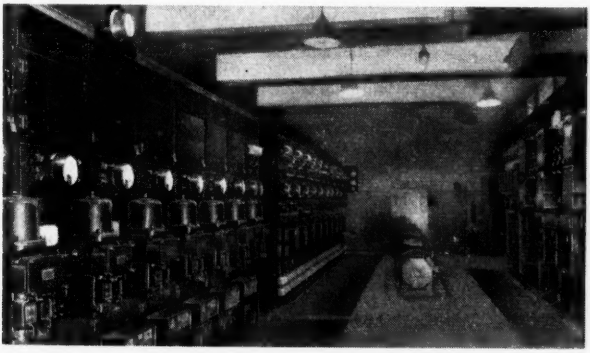
Nos. 3 and 4 substations (No. 3 shown on right) serve the refinery area

substation, so that all four of these sections are supplied normally from the C.E.B. compound No. 2. Similarly, sections C1, C2, D1 and D2 are supplied normally from C.E.B. compound No. 1, ignoring possible load exchanges through the interconnector.

The low-voltage distribution system for the southern part of the factory, served from substations Nos. 1 and 2, therefore consists of eight entirely separate low-voltage sections, with main feeders from the substation switchgear to large Reyrolle h.r.c. unit fuse boards, and thence to Parmiter, Hope & Sugden distribution fuse boards, also with h.r.c. fuses, and finally to oil-immersed Ellison circuit breakers or contactor switches near the motors. The drives in each plant are subdivided across two substation sections as far as possible, and the main unit boards are situated in annexes alongside the buildings, so that they are outside the actual chemical plants. The various l.v. motors are protected by overload coils on all phases (with the usual n/v trips), whilst the h.r.c. fuses give the cables short circuit protection.



In the refinery area the l.v. feeders terminate at flameproof switchgear banks



3·3-kV switchgear (near left) in No. 1 iso-octane switchroom is fed from No. 3 substation ; 400-V switchgear (right) fed from l.v. system ; d.c. switchgear (far left)

The lighting distribution system is entirely separate from the l.v. power system, and comprises four main unit boards, three-phase, four-wire, one connected to each of the main l.v. switchgear sections A, B, C and D. These Reyrolle boards are situated in the substations, and feed subsidiary three-phase, four-wire distribution boards at the various plants in a manner similar to that of the power. For supplying production instruments at 230 V, 400-V/230-V transformers here and there are fed from the 400-V power system, and they distribute to iron-clad fuse boards.

From one section only of the 11-kV switchgear in each of the substations Nos. 1 and 2 is fed directly one of the substations Nos. 3 and 4 in the north part of the factory; these are interconnected at 11-kV but the 11-kV switchgear in each substation is not sectionalized. The 11-kV switchgear in each of the secondary main substations is of Allen West manufacture and of the single-busbar vertical-isolation type, with a rupturing capacity of 350 kVA.

Near each of the secondary substations there is a 3,500-kVA Metrovick 11-kV/3·3-kV transformer which serves a bank of Allen West switchgear of 75-MVA rupturing capacity, situated in the same switchroom as its 11-kV switchgear. Two feeders from this 3·3-kV switchgear in the No. 3 substation serve the No. 1 iso-octane unit via 3·3-kV cubicle-type duplicate busbar switchgear, with pole operated isolators, situated in the plant switchroom. This Metrovick

gear has a rupturing capacity of 75 MVA. Another 3·3-kV feeder from the No. 3 substation serves Allen West switchgear in the No. 1 light-oil unit. Similarly the No. 2 iso-octane and light-oil units are fed from the 3·3-kV switchboard in the No. 4 secondary main substation. Feeders at 3·3 kV run from the switchboards in the two light oil units to the finished products tank farm, serving a 60-kVA, 3·3-kV/400-V transformer in each case. Each of these transformers is connected to one section of a bank of flameproof contactor switchgear which supplies the various pump drives in the area.

For the l.v. supply at the north end of the factory a 750-kVA, 11-kV/400-V transformer is installed at each of the Nos. 3 and 4 substations serving banks of Allen West 400-V switchgear. The 11-kV, 3·3-kV and 400-V switchgear associated directly with substations Nos. 3 and 4 are all in the same room.

For the 400-V distribution in the refinery area the lay-out and equipment are rather different, because the whole area is classed as hazardous and requires electrical equipment with flameproof enclosures. In order to exclude all fuse boards, therefore, the main low-voltage feeders serve banks of flameproof switchgear or contactor gear which control the various motors. Banks of such switchgear in different plants or pump houses are interconnected so that in the event of one substation being put out of action the plant normally supplied by this substation can be fed from the other substation through the motor distribution equipment.

The cables constituting the low-voltage network generally throughout the whole of the factory range in sizes up to 0·4-sq in. three- and four-core cables. About 60 per cent of the cable for the whole factory is laid underground, either direct or in open ducts, but for the accommodation of the remaining part of the cable good advantage has been taken of the excellent opportunities provided by the system of pipe bridges which is a characteristic feature of the factory. In the refinery section all outside cables are laid direct underground.

A stand-by power supply at 11 kV is available from the Lancaster power station through the Morecambe Corporation network, and can be utilized in the event of a complete failure of the two grid feeders. This stand-by supply is fed in at the plant substation of the adjacent M.O.S. Nitrates Factory (not otherwise mentioned in this article) which is in turn fed from the Trimpell network. By suitable arrangements the stand-by supply can be made available for the exclusive use of Trimpells.

We are indebted to Dr. L. E. Smith, general manager, Trimpell, Ltd., for obtaining the permission of the Ministry concerned for our visit to the factory and to publish this article, and to Mr. J. W. Binns, senior electrical engineer, for providing information and data.

Australian Notes

From Our Own Correspondent

THE proposed Snowy River scheme which is devised to extend irrigation projects along the Murray River and to provide new hydro-electric power sources will, it is anticipated, cost some £65,000,000. The amount of power available from the Murray under this scheme would be 668,000 kW, whereas power available under a similar Murrumbidgee scheme would be only 256,000 kW.

The New South Wales Cabinet has authorized the building of a new power station on the western shore of Lake Macquarie at a cost of approximately £3,000,000. The station will burn coal, and will help to serve Sydney, Newcastle and the surrounding districts. It will have an initial capacity of 100,000 kW and an ultimate capacity of 300,000 kW.

The Clark Dam, nearing completion at Butler's Gorge, Tasmania, is the biggest of its kind in the Southern Hemisphere, and it will back up the waters of the Derwent River over an area of some 10 square miles. It forms part of power development works to cost between £7,000,000 and £10,000,000, and the Hydro-Electric Commission expects that the crest of the 200-ft-high dam will be reached by the end of the year.

During the forthcoming session of the Victorian Parliament a Bill will be introduced to enable the State Electricity Commission to undertake a new brown coal open cut at Morwell South. The estimated cost of the project is £14,500,000.

The Victorian State Electricity Commission reports record progress in extensions of electricity supply to rural areas during the first financial year of its post-war development programme, and a total of 17,635 new consumers has been added to its supply system.

Representatives of electrical contractors' organizations from all States recently met in Melbourne, and alarm was expressed at the serious shortage of materials which retarded electrical installation work, particularly in new homes. The meeting expressed the opinion that it appreciated the difficulties which manufacturers of such goods were experiencing in production, but it felt that no efforts should be spared in speeding up output.

Views on the News

Reflections on Current Topics

ON many occasions I have deprecated the practice of robbing electricity funds for rates but never have I come across so startling a suggestion as that which Mr. E. E. Sharp reports from Cape Town where, with Mrs. Sharp, he recently stayed during a health tour. The city's finances appear to call for a substantial increase in the rates but as this would prove unpopular with business people it has been proposed that electricity charges should be raised instead—the running charge of the two-part tariff by 25 per cent and the fixed charge by 12½ per cent. It would be wrong if anybody were to interfere in a Dominion matter of this kind, but such precedents are seized on with enthusiasm by some people in this country and that is why I hope the idea will not be proceeded with.

* * *

Cheltenham Electricity Committee seems determined to hide its electric light under a suburban bushel. In other words it has agreed to move its showroom from the centre of the town to an outlying building. I can understand a Corporation which requires accommodation forcing such a move, but it is strange to find an Electricity Committee agreeing to it even if it is allowed a room at the central municipal offices as an inquiry bureau. A public service should be run for the public's convenience and it is inconvenient for people to have to travel some distance to see apparatus or secure information.

* * *

Surprise has been expressed in some quarters at the growth of electricity consumption since the war. It has even been suggested that this is a sort of political manœuvre against the Government. Yet the increase is only a fraction of what can be expected when the full demand is unleashed. This was brought home to me in reading some recent reports on the consumption in "all-electric" temporary dwellings. At Leyton, 136 emergency hutments were found to have an average annual electricity consumption of 4,472 kWh, compared with an average figure of 781 kWh per domestic consumer over the whole area. Incidentally, the running cost to the tenants worked out at only 4s. 1½d. per week. Another report, from Oswestry, gives the average cost to the tenants of 50 prefabricated bungalows as 4s. 7d. a week gross (before deduction of rebates) with an average annual electricity consumption of 3,075 kWh.

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There is nearly always something of topical interest in past volumes of the *Electrical Review*. Nationalization, for instance, was referred to in the very first number (November 15th, 1872) when the Editor gave it qualified approval—much qualified. He started as follows:—

> "The purchase of our telegraphic system by the State is in theory a matter of congratulation for the public, and we even look forward to the railways being bought up in the same manner. . . . [Here comes the reservation]. But, unfortunately in the case of the telegraph it is too much in theory and too little in fact that we derive benefit from the change which we expected would prove to be so advantageous."

He goes on to show that the advance in the art of actual transmission was nullified by the delays in delivery—sometimes amounting to hours. There are some who would maintain that the service has not improved much since 1872.

* * *

I hear that Mr. A. E. Marchant, the borough electrical engineer of Barking, is anxiously searching for information regarding his undertaking's history in preparation for the celebration of its jubilee. It seems that apart from statistics there is very little available. Perhaps some readers will be able to help. The Barking Electricity Department is overshadowed by its big neighbour, the County of London Electric Supply Co., whose station has arrogated the name of the district to itself.

* * *

An attempt to introduce a new work unit was made in the *Daily Express* last week. It was stated in an article that "by 1950, it is estimated, the average American working man will use electrical aids equivalent to the work power of 400 Pharaoh slaves." One pictures appalling congestion should an electrical breakdown necessitate the enlistment of this equivalent power.

—REFLECTOR

Industry and the House

The Demand for Steel

By F. J. Erroll, M.A., A.M.I.E.E., M.P.

THE Government's White Paper on "Capital Investment in 1948" reveals that the high priority enjoyed by the generating station programme will not last much longer. While certain expansion will take place during the coming year, the erection and completion of further stations after that will be somewhat retarded and the limit will be set by the amount of plant released for the home industry as distinct from the export trade.

The seriousness of this decision was well illustrated by Mr. Gaitskell's answer to Sir William Darling's question about the effect of staggering electricity consumption as a result of the recent recommendations. Mr. Gaitskell revealed that the reduction of peak load had resulted not only from direct staggering but by industries making use of alternative sources of power. He blamed the domestic and non-industrial users for causing further aggravation at peak periods, and appealed for them to help in its reduction. It seems therefore that while it may be possible to prevent the peaks from rising further, that will only lead to further increases in consumption at off-peak periods.

This situation is accepted in the White Paper in the following terms: "It is undesirable to have to rely on very old plant to fill the gap, but in view of the great shortage of steel and the urgent need to devote more capacity to export the Government consider it necessary to restrict the programmes . . . and to accept the risks of load-shedding."

New Priority Scheme

The shortage of steel haunts the whole of the White Paper and Mr. Marquand's statement on the development of a new priority system for steel was far from satisfactory. The time for a debate on industrial affairs is long overdue, but the Government is hardly likely to concede it while so much remains indefinite. Industries will have to realign their activities in the light of the White Paper, and Mr. Marquand will have to produce a clear-cut scheme of priorities if industry, and especially the electrical manufacturing industry, is to go ahead without repeated hold-ups. At present the claimants in the steel queue seem to perform a sort of Sir Roger de Coverley dance; each claimant when he reaches the top of the queue has the stage to himself for a short while before going to the bottom of the queue, while another claimant takes his place. Generating stations look like giving way to agricultural needs.

Manufacturers of electric motors, switchgear, and items of plant which are used either to manufacture goods for export or which form part of large units intended for export will not find the position made any clearer by the White Paper. The Government has rightly decided against reintroducing licences to acquire such equipment, and for the present it intends to rely "on the good sense of private industry following a policy lead."

Sub-Contractors and Exports

In this connection the statement issued by the Chancellor of the Exchequer and published in the *Board of Trade Journal* on December 6th is far from clear. He points out that "control" of sub-contractors or sub-sub-contractors will be through the end product. If the main contractor is able to back his orders with material allocations to the sub-contractor the latter may assume that he is working on an approved programme. He adds that it is unnecessary for sub-contractors to try and ascertain the ultimate destination of all the components such as ball bearings and electric motors which they make as he does not wish to encourage the unnecessary development of a system of returns within industry. The net result of all this is that the sub-contractor is at the mercy of the main contractor's ability and determination to export goods. Not a satisfactory position to be in.

The individuals appointed to the British Electricity Authority and the Area Board chairmen whose names were given in last week's *Electrical Review* would do well to study the debate in the House of Lords on nationalized industry. This followed a debate the previous week on the administration of National Boards. The later debate was initiated by a Socialist peer, Lord Lindsay of Birker, and he raised the problem of maintaining a central organization while

at the same time securing a proper measure of devolution. This is a matter which is engaging the serious thought of all those concerned with the development of these great State corporations. As Lord Lindsay said, " unless you devise an active system of devolution in all the nationalized industries which gives you, along with the general control, small units where there is responsible decision, you will not deal with the other profound question with which we are confronted—namely how to get the men to take an active part and show enthusiasm about it."

S.R. & O. No. 2386, which standardizes the production of steam turbo-alternators over 10,000 kW in size, to 30,000-kW and 60,000-kW sets, was carefully scrutinized by an unofficial Conservative committee known as the Active Back Benchers (or A.B.B.s) who study all Orders issued by the Government to see whether there is anything in them which should be raised in the House. The Committee was surprised that this standardization could not have been achieved by agreement since there are only about twelve manufacturers of heavy turbo-alternators in the country. As the industry was understood to be in favour of standardization at the present time it was felt that there was no real need for the Order nor for the penal sanctions which it contained. One point on which more information will be sought is the fact that the Order is in effect back-dated to cover all contracts entered into after November 1st, 1946.

PARLIAMENTARY NEWS

By Our Special Reporter

DURING the committee stage of the Finance Bill in the House of Commons, Mr. C. S. Taylor moved an amendment to exempt from the increased rate of purchase tax " batteries or accumulators used in wireless sets which cannot be operated by an electric mains supply." It seemed quite illogical to tax batteries for battery-operated sets, whereas the mains electricity supply got off scot free.

Sir Stafford Cripps the Chancellor of the Exchequer, said he would be prepared before the report stage to consider this matter and see if he could do anything, but he could give no promise. On this understanding, the amendment was withdrawn.

On the report stage an amendment was made exempting these batteries from the extra tax. [See note on page 890].

Effect of Staggering

Sir William Darling asked the Minister of Fuel and Power what figures were available to show the effect of the staggering of electricity consumption.

Mr. Gaitskell said that the national peak load periods varied slightly with the season but were at present between 7 and 9.30 in the morning and 4 to 6.30 in the afternoon, the highest half hours being between 8 and 8.30 in the morning and 5 and 5.30 in the afternoon. The figures available to show the effect of staggering on the peak load were obscured by many variable factors, but it was clear that a considerable contribution towards reducing peak load had resulted from the arrangements made by industry not only to transfer the load to other times of the day but also to make use of alternative sources of power. Figures for a recent week showed an increase in the maximum demand of only 0·9 per cent against an increase in total consumption of 4·8 per cent over last year. The night load had risen by about 500 megawatts and the evening load after 7 p.m. by an even larger amount while the actual peak loads were closely comparable to last year's. After allowing for the considerable increase in the domestic and non-industrial load at peak periods which appeared to have taken place, it was reasonable to conclude that the efforts of industry had produced a transfer of between 750 and 1,000 megowatts from the peak periods. Any further reduction in peak load must come mainly from the domestic and non-industrial consumer and it was of the utmost importance that they should use as little electricity as possible during the periods of peak demand.

Festival of Arts in 1951

Mr. Herbert Morrison, the Lord President of the Council, said he had now been able to examine, with his colleagues, the possibilities of marking the centenary of the Great Exhibition of 1851 by some national display in addition to the British Industries Fair. The Chancellor of the Exchequer, as President of the Board of Trade, said on March 28th that in spite of the difficulties then foreseen methods could undoubtedly be found involving relatively little new construction work outside the programme already in course of planning and that he was examining whether some progress towards the building of a permanent centre for the British Industries Fair could not be achieved in time for the centenary. It was now clear that under the revised investment programme no new construction work, for such purposes, could be undertaken for 1951. Nevertheless, the Government proposed to mark it by

a national display illustrating the British contribution to civilization, past, present and future, in the Arts, in science and technology, and in industrial design. The Chancellor of the exchequer was therefore inviting the Arts Council of Great Britain to make arrangements, in association with other bodies concerned, for a Festival of the Arts in 1951. Provision would be made to link up with it existing ventures in Edinburgh and elsewhere, and to encourage new ones.

Besides the Festival, there would be two major national exhibitions. The President of the Board of Trade was inviting the Council of Industrial Design to sponsor a first-rate design display and he was arranging for an Exhibition of British achievements in science and technology to be organized by the Central Office of Information.

Licences for Poles

Mr. Gooch asked the Minister of Fuel and Power if he would review the priority categories prescribed for the issue of licences for poles for electrical development in the rural areas; and if he would consider the possibility of acquiring suitable poles from landowners in the districts not yet served.

Mr. Gaitskell said he regretted that he could hold out little hope at present of extending these priority categories, as the supplies of poles were insufficient to meet all demands within the categories now accepted as essential. Arrangements already existed for the acquisition of suitable standing timber from local landowners, but if Mr. Gooch knew of any landowners willing to sell trees suitable for poles, the information should be passed on to the Board of Trade.

Socialized Industries

Mr. Morrison, replying to Mr. Granville Sharp, said that with experience so far gained, the Government had reviewed the question of replies to Parliamentary inquiries about the work of socialized industries. Under recent legislation boards had been set up to run socialized industries on business lines on behalf of the community and Ministers were not responsible for their day-to-day administration. A large degree of independence for the boards in matters of current administration was vital to their efficiency as commercial undertakings.

A Minister was responsible to Parliament for action which he might take in relation to a board or action coming within his statutory powers which he had not taken. This was the principle that determined generally the matters on which a question might be put down for answer by a Minister in the House of Commons. Thus the Minister would be answerable for any directions he gave in the national interest and for the action which he took on proposals which a board was required by statute to lay before him. It would be contrary to this principle and to the clearly expressed intention of Parliament if Ministers were to give information about day-to-day matters. Undue intervention by the Minister would tend to impair the board's commercial freedom of action. The boards of socialized industries were under an obligation to submit annual reports and accounts which were to be laid before Parliament. In the Government's view it was right that Parliament should from time to time review the work of the boards, on the basis of the reports and accounts presented to Parliament.

Advertising "Tax" Withdrawn

During the Committee stage of the Finance Bill last week, the Chancellor of the Exchequer agreed to withdraw the provision that only half of the expenditure upon advertising should be allowable against income tax (with certain exceptions). Sir Stafford Cripps said that he had received an assurance from the Federation of British Industries that it would set up a committee representative of the interests concerned to work out methods of achieving the object of the clause by voluntary means. That object was to economize in materials and effort in advertising.

Fibre Glass Development

A RECEPTION was held at Brown's Hotel, Dover Street, London, W., on December 2nd, by Fibreglass, Ltd., at which particulars were given of the company's plans for the future. In addressing the assembly Sir Hugh Chance (chairman) said that Fibreglass, Ltd., was started by Chance Brothers, in Glasgow in 1930, to manufacture heat and sound insulation products made from fine glass fibres. In 1938 plans were laid to enter the textile field, and to establish in England under licence the processes of the Owens-Corning Fiberglass Corporation of America. At the same time the company's resources were reinforced by an arrangement with Pilkington Brothers. During the war output of both heat insulation and textile products increased rapidly and two new factories for textiles were set up in the Glasgow district and a third at St. Helens was taken over in 1945 with the object of building a mass production plant for insulation for the Ministry of Works' temporary housing scheme.

Sales in the textile field, still mainly confined to electrical insulation products, such as yarn, paper and cloths, had already outrun production capacity, and early in the new year a large extension to the company's Textile Division would start operations. In the field of heat insulation output was now of the order of several hundred tons per week, and plans were in hand to develop several new lines such as super-fine fibres for aircraft insulation, battery separator plates and impregnated tissue for the protection of fuel oil pipe-lines. Many of their products entered directly into the export drive.

PERSONAL and SOCIAL

News of Men and Women of the Industry

THE British Electricity Authority announces the appointments of **Mr. R. Halsall** and **Mr. S. M. Rix** as deputy secretaries to the Authority. Mr. Halsall has been deputy secretary to the Central Electricity Board since 1945 and was previously assistant secretary in the Board of Trade (1944-45) and the Ministry of Aircraft Production (1941-44). From 1921 to 1941 he served in the Inland Revenue Department. Mr. Rix is secretary and assistant manager of the Lancashire Electric Power Co., and has been with the company for twenty years.

Mr. S. M. Rix

In the House of Commons on Tuesday the Minister of Fuel and Power (Mr. Gaitskell) stated that after consultation with the B.E.A. he had appointed **Sir Norman Duke** and **Mr. S. F. Steward**, C.B.E., to be chairmen designate of the South-East Scotland and the South-Western Area Boards, respectively. Sir Norman Duke was Joint Deputy Secretary, Ministry of Fuel and Power (in charge of the Petroleum Division) in 1944-45. Mr. Steward, of E. R. & F. Turner, Ltd. (Bull Motors), was Director-General of Machine Tools under the Ministry of Supply during the war.

Mr. S. F. Steward

Col. R. J. Weale, M.C., who was formerly a director of Drake & Gorham, Ltd., and until recently associated with Troughton & Young, Ltd., has joined the board of directors of Scemco, Ltd., 6-7, Soho Street, Oxford Street, W.1, fluorescent lighting and electrical components specialists.

Mr. F. W. Miller has been appointed sales manager to Miller & Elterman, manufacturers of "Allan" electrical appliances, of Gibraltar Street, Sheffield.

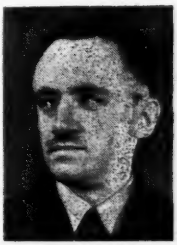
Col. R. J. Weale

Sir George Usher, managing director of International Combustion, Ltd., and chairman of Aberdare Cables, Ltd., left England on December 4th to visit South Africa in connection with the development of the newly-established Aberdare Cables of South Africa, Ltd. The work on a factory at Port Elizabeth is well advanced. Sir George is making an extensive tour on behalf of his group of companies in connection with the export drive.

Mr. C. R. Westlake, M.I.E.E., general manager and engineer of Finchley Electricity Department, who was recently appointed to the temporary position of Electrical Adviser to the Uganda Government, has now arrived in Uganda, anp his address is P.O. Box No. 559, Kampala, Uganda.

Mr. R. Pullen, assistant engineer in the Blyth and Whitley Bay area for the North-Eastern Electric Supply Co., Ltd., for the past thirty years, has retired. He has received a presentation from his colleagues, the gift being handed over by Mr. J. Swangund.

Mr. W. Szwander, Dipl. Ing. (Warsaw), M.I.E.E., took up his appointment as chief technical assistant in the City Electricity Department, Belfast, on December 1st. Mr. Szwander, who is thirty-nine years of age, is a naturalized British subject of Polish origin. He obtained his school and university education in Warsaw, where from 1932 to 1939 he served in the municipal electricity supply undertaking, in the last few years in the capacity of chief electrical engineer in the Development and Constructional Department. He came to this country in 1940 as an officer of the Polish Army, and was directed to war work, and from January, 1941, to November, 1947, was engaged with the Metropolitan-Vickers Electrical Co., Ltd., Manchester. Mr. Szwander is the author of numerous literary contributions in the form of Institution papers and articles in the Press, and has been a contributor to the *Electrical Review*.



Mr. W. Szwander

Mr. H. W. G. Dedman, B.Com.(Lond.), has been appointed by the Wimbledon Corporation as commercial assistant in the electricity undertaking, in succession to **Mr. B. A. Larney** who has retired. Mr. Dedman has been a member of the staff of the West Ham Corporation electricity undertaking in various capacities for twenty-

seven years and is at the present time technical administrative assistant in that undertaking. He will take up his duties at Wimbledon on **January 1st.**

Dr. E. W. Smith has been appointed to the board of Submarine Cables, Ltd., which is owned jointly by Siemens Bros., & Co., Ltd., and the Telegraph Construction & Maintenance Co., Ltd.

Mr. C. M. Nesbitt, general sales manager of Dorman & Smith, Ltd., and its associate company, DS Plugs, Ltd., will leave this country early next month for a business tour including the United States, Australia, New Zealand, Malaya, Argentina, Mexico, Brazil, Chile, Iraq and Egypt.

Mr. O. A. Pallett, supervisor of purchases of the British Thomson-Houston Co., Ltd., has been appointed chairman of the A.E.I. Group Purchasing Committee to take effect on **Mr. J. Billington's** retirement on December 31st. Mr. Pallett joined the B.T.H. Co. in 1912 and was appointed supervisor of purchases on the death of Mr. J. E. Betts in July, 1945.

Mr. O. A. Pallett

Mr. A. F. Scargill, mains engineer at Batley Electricity Works since 1931, has been appointed borough electrical engineer in succession to **Mr. P. M. Maxwell,** who is retiring at the end of the year.

Mr. V. G. Wackrow, who has been lighting engineer for Benjamin Electric, Ltd., in South Wales for many years, has now joined Thorn Electrical Industries, Ltd., as district lighting engineer.

Mr. Idris Williams has been appointed district mains engineer for the North Wales Power Co. in the Wrexham rural area, in succession to the late Mr. G. T. Brown.

The appointment of **Col. Stanley Bell,** O.B.E., J.P., to the board of Oldham & Sons, Ltd., mentioned in last week's issue, takes effect in June next. Col. Bell is associated with a number of motor distributing concerns and is managing director of the Astley Industrial Trust, Ltd.

The annual dinner of the Ipswich and District Electrical Association took place at the Great White Horse Hotel, Ipswich, on November 28th. The chief guests were **Mr. J. N. Waite,** of the Central Electricity Board, and **Mr. H. H. Dawson,** managing director and works manager of Ransomes, Sims & Jefferies. **Mr. K. L. V. Nichols** (General Electric Co.) occupied the chair. Mr. Waite, in proposing the toast of the Association, outlined the magnitude of the job facing the supply section of the industry. Mr. Nichols said that he foresaw the possibility of the Association's forming a useful liaison between a State operated authority and the domestic consumer. The president of the Association, **Mr. G. A. Vowles,** engineer and manager of the Ipswich Corporation Electric Supply Department, in proposing the health of the visitors, to which Mr. Dawson responded, referred to the urgent need for the co-operation of all users of electricity.

"Austerity" regulations forbade the holding of its annual dinner-dance by the Association of Electrical Machinery Traders this year. Instead a buffet supper dance was arranged at the May Fair Hotel, London, W.1. It proved a very successful affair, the dancing to Frederick Arthur's Band being supplemented by an excellent "floor show." During an interval **Mr. W. E. Lawton,** the Association's chairman, made a brief speech in which he mentioned the way in which members had helped manufacturers to overcome their difficulties during the fuel shortage early this year. In particular he referred to the remarkable feats which they had performed in the conversion of obsolescent d.c. machines into three-phase plant. Credit for the organization of the function is due to Mr. J. T. Morgan, secretary of the A.E.M.T.

The M-V. Dramatic and Operatic Society (Metropolitan-Vickers Electrical Co., Ltd.), presented Roland Pertwee's "Pink String and Sealing Wax" at the M-V. Club Theatre from November 24th to 29th. Jean Macpherson, Led Tredgett, Tom Davies and 14-year-old Sheila Hay were conspicuous among a well balanced cast, and the Victorian setting formed a perfect frame for this thrilling episode in the public and private life of a Brighton chemist. The play was produced by Harold Carter.

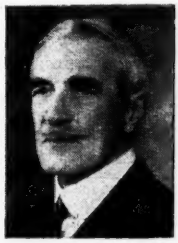
For its twelfth production the Johnson Matthey Dramatic Society presented "Love from a Stranger," the well-known thriller by Frank Vosper, at King George's Hall, W.C.1, on December 4th, 5th and 6th. This story of a girl who suddenly becomes rich and marries a homicidal maniac calls for sustained dramatic acting, and the hints of the tragic event to come are skilfully conveyed in the earlier part. In the tense final scene Carol Webb as the girl and Frank Braby as the would-be murderer gave brilliant performances, and they were well supported by a cast many of whom have distinguished themselves in past productions.

Students at the Prescot works of British Insulated Callender's Cables, Ltd., recently met to receive awards in connection with their educational attainments during the past year. **Mr. J. L. Harvey** (manager, production), was in the chair, and among those present was County Councillor J. P. Preston, who is a member of the management committee of the company's day continuation school. Mr. Harvey spoke of the importance which the company attached to the work of the Education Department and he congratulated those whose success had been marked by awards. The

education officer, **Mr. N. G. Treloar,** gave details of the school's progress during the year. **Dr. J. L. Miller,** chief electrical engineer to the company, made the awards to seventy-five students, thirty-one of whom were members of the company's educational scheme, inaugurated two years ago under the auspices of the Lancashire Education Committee, whereby educational facilities are provided on the company's premises for 250 boys.

Obituary

Mr. R. P. Sloan.—We report with great regret the death at Nice on December 6th of Mr. Robert Patrick Sloan who had been ill for some time. Mr. Sloan had served as a member of the Central Electricity Board since 1936. He was born in Aberdeen in 1874 and was educated at Watson's College and the Heriot-Watt College, Edinburgh, and Finsbury College, London. After serving an apprenticeship and securing technical experience at the Woolwich works of Siemens Bros., he joined Merz & McLellan at Newcastle in 1900. Three years later he was appointed manager of the Newcastle-on-Tyne Electric Supply Co. (now the North-Eastern Electric Supply Co.). He became a director of the company in 1915 and in 1921 was appointed chairman and managing director, a position which he held until 1934 when he retired. Mr. Sloan had also been a director of other electricity concerns, including Edmundsons Electricity Corporation, Ltd., the Shropshire, Worcestershire & Staffordshire Electric Power Co. and the South Wales Electric Power Co.



The late Mr. R. P. Sloan

For many years Mr. Sloan was active in the promotion of electrical ideas. He had served as president of the British Electrical Development Association, of the Incorporated Association of Electric Power Companies, the British Electrical & Allied Industries Research Association and the Electrical Industries Benevolent Association. He had been vice-president of the Institution of Electrical Engineers of which he had been a member since 1910. He was also connected with a number of other bodies, such as the World Power Conference, the Federation of British Industries, and Durham University. He had served on numerous committees dealing with electricity supply questions and was a leading witness before the Williamson and McGowan Committees. Mr. Sloan was awarded the C.B.E. in 1919.

Mr. L. S. Powell.—We regret to record the death of Mr. Legh Sylvester Powell, one of the pioneers of electric lamp development, which occurred on December 2nd at Dorking at the age of ninety-two. Mr. Powell was born at Versailles in 1855 and was a student at the School of Mines, London. In 1878 he became associated with Dr. J. H. Gladstone, F.R.S., as an assistant in his private laboratory, and in 1882 became chemist at the Anglo-American Brush Co.'s lamp factory. Six years later he joined J. W. Swan in his private laboratory, and in 1891 returned to France as chemist with Pulsford Triquet et Cie, Paris. From 1898 to 1901 he was associated with the Nernst Lamp Co., Ltd. Mr. Powell was the inventor of the process for the manufacture of cellulose thread (for carbon filaments) by the zinc chloride process in 1884, and a bobbin of the thread of that period is now in the Science Museum, South Kensington. He was a contributor to the *Electrical Review* in his earlier days on carbonization of filaments by electricity, the Cooper Hewitt mercury vapour lamp, and other articles relating to early electric lamp developments. He had been a member of the Institution of Electrical Engineers since 1898.

Mr. E. W. Hill.—We regret to learn that Mr. E. W. Hill, M.I.E.E., general sales manager of Aron Electricity Meter, Ltd., died on November 27th. He had been associated with the company for forty-five years.

Will.—**Mr. W. H. Morton,** director and secretary of Bruce, Peebles & Co., Ltd., left personal estate in England and Scotland valued at £15,193.

Correspondence

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for correspondents' opinions.

High-Voltage Transmission

IN a note on 500-kV transmission line tests in the *Electrical Review* for November 21st, it is stated that "little information now exists about corona at the voltages envisaged, especially as influenced by weather conditions."

This is not so, for apart from the few results that have emanated fairly recently from one or two Continental countries outside Germany, the Germans themselves carried out extensive measurements at 400-kV during the war on both conventional conductor lines and on Bündelleitungen (lines with more than one conductor per phase).

Much of this information has already been collected by a team of investigators sent over from this country, and in due course the results, which include the effect of weather conditions, will be published as a B.I.O.S. report on German industry.

Prescot. W. G. HAWLEY.

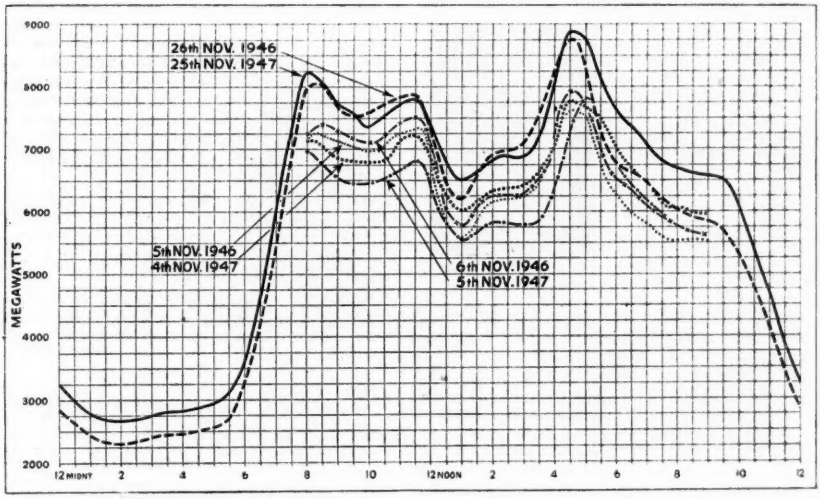
Load Spreading

Differences in Regional Curves

DURING the first month after the introduction of load spreading on October 6th, comparisons with the same period of 1946 offered no clue to its efficacy, since British Summer Time was in force until November 3rd, whereas Greenwich Mean Time was in use last year. Comparing the general position on Tuesday, November 26th, 1946, and Tuesday, November 25th, 1947, the kWh generated increased by 5·7 per cent from 133·5 million to 141·1 million, whereas the maximum demand increased from 8,700,000 kW to 8,850,000 kW or 1·7 per cent. It was colder this year with average temperatures of 39 deg F in the morning, 43 deg in the afternoon and 37 deg in the evening, as against 44, 49 and 46 deg F. The night and late evening load was greater, and the morning load came on a little earlier.

The other curves here presented for days earlier in the month illustrate similar trends. Average temperatures for Tuesday, November 4th, 1947, were:—morning 45 deg, mid-day 52 deg and evening 51 deg, as against 48, 56 and 54 deg F for Tuesday, November 5th, 1946. On the following day the figures were 48, 53 and 48 deg F in 1947 and 48, 51 and 46 deg F in 1946.

There were marked differences in the load curves for individual regions. All show an increase in night load. In Scotland an increase in kWh on November 5th, 1947, over November 6th, 1947, of 11·5 per cent discounted a slight increase in the morning and evening peaks. In North-West, Mid-East and North-East England there was no substantial change in morning and afternoon peaks, although the increase in night and late evening loads was marked. In Central England there was some reduction in the morning and early afternoon, although similar increases in night loads were obtained.



National daily load curves on various dates showing effects of load spreading

South-East England had a relatively high peak between 4.30 and 5.30 p.m., and a peak developed between 8.0 and 8.30 a.m. The South-West England load curve showed a decrease of nearly 30 per cent in day kW owing to higher temperatures; there is a large proportion of continuous process load in this area.

Breakdown at West Ham

DURING repairs to an e.h.v. feeder at Canning Town last Monday a live feeder was accidentally cut into at 4.42 p.m., causing a heavy "short." The feeder switch cleared the "short," but the grid system switches operated, leaving the West Ham power station to supply the West Ham and East Ham distribution areas. The additional burden caused a serious fall in frequency and voltage and necessitated shedding part of the West Ham load. Conditions were normal again at 5.12 p.m. Two employees were detained in hospital with burns.

Insulating Oil

Cause of Deterioration and Method of Testing

TWO short papers read at this week's meeting of the Transmission Section of the Institution of Electrical Engineers concerned oil used in transformers and switchgear.

In the first paper MR. H. HURWORTH (Leeds Corporation) suggests that the early stages of oil deterioration progress at a rate that is characteristic of autocatalysis, being followed by a prolonged period during which the rate is controlled by the partial pressure of oxygen in the atmosphere.

Tests are described which indicate the degree of improvement likely to be gained by slightly modifying the design of transformers with the object of increasing the oxygen pressure-gradient. The best way of doing this is to provide a barrier just below the surface of the oil while the period of autocatalytic acceleration can be shortened further by increasing the depth of the expansion chamber, or reducing its cross-sectional area.

The author believes that the practice of removing volatile acids by ventilating the oil expansion chamber is not the best way of trying to solve the corrosion problem; indeed he says it will shorten the useful life of the oil. The initial advantage of ventilation as a means of reducing maintenance may later be lost through the formation of excessive amounts of sludge and acid by the action upon the oil vapour of electrical stress due to line conductors, terminals and insulators projecting above the surface of the oil.

It is also probable that the orientation of volatile acid molecules under electrical stress causes them to be retained inside the transformer instead of passing out of the breathing orifice with other less harmful vapours. The ejection of corrosive vapour is also retarded by condensation on cold cover plates; therefore, lid gaskets should be made of heat-conducting materials. Avoidance of electrical stress within the expansion chamber and attention to the other details mentioned will render it unnecessary to ventilate the chamber.

Tests at Leatherhead

In the second paper MR. J. S. FORREST (Central Electricity Board) describes how investigations at the Leatherhead research laboratories have demonstrated that measurement of the d.c. resistance of hydrocarbon oils provides more information about the condition of used oil than any other single test. Such d.c. tests are easier to perform than power factor tests and require simpler and less bulky equipment. They can be a criterion of oil condition within the following limits of resistivity, measured at 20 deg C within the test cell: 10,000 megohms signifies "good" condition; less than 10,000 but more than 1,000 megohms indicates "fair" condition. Corresponding megohm-cm values are obtained by multiplying those figures by 2,000).

The sample of oil required is about 1·5 pints (0·85 litre) and is tested at 5,000 V (10,000 V/cm stress) in a cell containing specially shaped electrodes in conjunction with an electronic ohmmeter. The outfit has been developed in conjunction with the British Thomson-Houston Co. and is sufficiently robust for field testing.

The author believes the d.c. resistance test to be the most reliable single-test guide to quality of oil and he suggests that it should become a standard test which could supplement, and perhaps ultimately replace, the present electric strength test.

Atomic Physics Film

A CORRECT perspective of the evolution of modern nuclear physics can be obtained by students and others from a new film produced by G-B Instructional, Ltd. "Atomic . ysics" owes its accuracy to the collaboration of eminent scientists, public bodies and commercial concerns, and ends with a discussion of future prospects by Professor Einstein and Dr. J. D. Cockcroft. The film takes about 1½ hours to view and is in five parts, which can be run as separate films. The first outlines progress in the nineteenth century from Dalton's atomic theory, bringing in Faraday's experiments with electrolysis and Mendeleeff's periodic table, and states the then prevailing ideas as to the size of atoms and molecules.

The second part deals with cathode rays and the discovery of the (negative) electron, positive rays and X-rays, with especial reference to the work of Sir Joseph Thomson. The next in the series, after showing the contributions of Becquerel and of the Curies in regard to radio-activity, deals with Lord Rutherford's fundamental theory of the nuclear structure of the atom as the simple concept of a "planetary system" (the modern and mathematically complex conception of wave mechanics presumably does not lend itself to pictorial representation) and H. G. Moseley's work in support of the theory.

The turn given to developments by the discovery of the neutron provides the main theme for the fourth section, with explanations of the investigations of the Joliot Curies and Sir James Chadwick. This is followed by shots illustrating the splitting of the lithium atom by Cockcroft and Walton in 1932 and an explanation by Einstein of how their success supported his theory of the equivalence of energy and mass. In the last set the principal details relating to uranium

fission are described, with a speech by Professor Frisch. Piles are illustrated for producing heat, Dr. Cockcroft expressing the hope that these will make a substantial contribution to the production of power within a few decades and pointing out that benefits are already being received through the medical use of radio-activity. The film ends with a recapitulation of its leading features, which knits the whole together.

Electricians' Hours and Wages

New Agreement Effective in January

A REVISION of hours and wages in the electrical contracting industry is to take effect from the first pay-day in January, 1948, for the period covered by that pay-day under an agreement reached by both sides of the industry's National Joint Industrial Council.

The new agreement introduces a 44-hour standard working week (against a standard week of 47 hours as at present) and adjustments in wages which partly comprise an increase in the hourly rate consequent upon the shortening of the working week and partly a basic wage increase.

The new rates have been stabilized until the first pay-day in September, 1948; the shorter working week may be worked over 5 or 5½ days at the sole discretion of the employer; when Saturday work is performed by operatives subject to a 5-day week time-and-a-half is payable for all hours worked; and the new standard night shift week will be one of 43¾ hours.

The basic hourly rates for journeymen electricians will be as follows:—Grade "A" Area, 2s. 4d.; Mersey District, 2s. 1½d.; Grade "B" Areas, 2s. 0½d. All rates are subject to a temporary hourly addition of 9d. The rates of adult mates are proportionately adjusted and they are in all cases entitled to the full hourly addition. Similar adjustments are made in the basic pay of male labour under 21 years of age but in these cases the hourly addition is 3d. for labour under 18 and 6d. for those between 18 and 21.

The 44 hours are to be worked either in 5 or 5½ days as decided by the employer for each particular job. In the former case there will be four 9-hour days and one 8-hour day. In the 5½-day week there will be five 8-hour days and a 4-hour half-day.

It is an express condition of the new agreement that both employers and operatives shall do all possible to secure increased output; and the operatives shall give their maximum skill and service to the industry and shall ensure a full day's work.

Arrangements have also been made regarding the wages of boys aged 15 employed in the industry. They are to be paid 15 or 20 per cent of the journeyman's basic rate, according to whether they are destined for Category II or Category III, and they will also receive a temporary hourly addition of 3d.

London Undertakings

Proposed Reconstitution of Conference

CONSIDERATION has been given by the Conference of Local Authorities Owning Electricity Undertakings in Greater London to the position which will arise under the operation of the Electricity Act, 1947. This Conference was set up over thirty years ago to protect and advance the interests of the constituent undertakings, discuss questions relating to electricity supply in Greater London and advise and assist members in the administration of their powers and duties. There are forty-one members with electricity undertakings within the London and Home Counties Electricity District.

As from the vesting date under the new Act (yet to be announced) these local authorities will lose their supply systems and will cease to exist as "authorized undertakings." In these circumstances it has been decided to wind up the Conference on March 31st next. It is considered desirable, however, to form a new association composed of all local authorities in the area of the new London Electricity Board and also present members whose districts may be wholly or partly outside that area. All local authorities in the area are being asked by the honorary secretary (Mr. W. H. Warhurst, Town Clerk, Hammersmith) whether they are prepared to support this scheme.

If there is sufficient support it is proposed to take the necessary steps to set up the new association and, subject to the concurrence of the Minister of Fuel and Power and the authorities concerned, to transfer the surplus funds and assets of the Conference to the new body. A special committee is being appointed to work out details.

In his letter to the authorities, Mr. Warhurst sets out the main reasons for continuance of the Conference in a new form. These include the continuing interest of the authorities in ensuring a cheap and abundant supply of electricity to their residents and the fact that they themselves are substantial users of electricity. Many questions will arise under the Act which could be conveniently dealt with by a representative association and this would be a suitable body to assist the Minister of Fuel and Power in the appointment of the Consultative Council for the area. It is anticipated that membership of the new body would be between sixty and eighty.

Underground Railway for Lisbon

The Portuguese Government has authorized the Lisbon Town Council to grant an exclusive concession for the establishment of one or more companies to build and operate an underground railway system in Lisbon. The Town Council, which will be an associated member of any of these companies, will draw up tenders which will be subject to approval by the Minister of Communications. — *Reuter's Trade Service* (Lisbon).

COMMERCE and INDUSTRY

New British Standards. Revised Steel Scheme.

CABLE glands and sealing and dividing boxes intended to be filled with solid-setting bituminous compound, not oil, are the subject of the revised B.S.542, which is one of the series specially catering for colliery requirements, but is applicable also to other industries. Details of construction, methods of jointing, bonding and sealing are specified together with the minimum recommended sizes of copper rod connectors. Minimum slip loads for the grip of the armour clamp have been prescribed as an alternative to minimum lengths of armour clamping surfaces.

The system of lettering, for identification, the electrodes and other component parts of valves embodied in electronic devices has been standardized by the issue of B.S.1409, which prescribes the series of symbols to be used in specifications, catalogues and technical literature generally.

In addition to the specification which standardized plugs and sockets for charging vehicle batteries, there has now been issued B.S.1412 for the fittings (terminal post thimbles and sockets) forming the attachment of cables to lead-acid batteries of up to 400 Ah capacity. Materials to be used, dimensions and method of marking polarity are prescribed.

The above documents are obtainable for 2s. each from the British Standards Institution, 24, Victoria Street, London, S.W.1.

Reports on Atomic Energy

A further list of American declassified reports on atomic energy has now been issued. Copies, in the form of enlarged prints (about 9 in. by 7 in.) from microfilms, may be ordered from H.M. Stationery Office, P.O. Box 569, London, S.E.1. The list comprises 140 reports, the prices of which range up to 53s. 10d. for " Neutron Spectrometer Circuits."

Canadian Trade Fair

The first Canadian International Trade Fair, to be held in Toronto from May 31st to June 12th, 1948, has developed in size and scope far beyond original expectations. Reservations have been accepted for more than 1,050 separate exhibits, representing the products of twenty-five different nations. The amount of floor space finally allotted is more than treble that which was originally provided, and the Government organizers say that there is still a waiting list of potential exhibitors whose only hope of accommodation is the possibility that one of the accepted exhibitors in their own trade classification may yield their space. There will be sections for domestic appliances and electric tools, motors and supplies.

Electricity Economy Exhibition

An exhibition, forming part of a campaign arranged to encourage economy in the use of electricity by domestic consumers, is being held at the Twickenham showrooms of the London and Home Counties J.E.A. Thirty local manufacturers are exhibiting samples of their products, which are made in the district, and the attention of domestic consumers is drawn by suitable slogans to the fact that the production of these articles for export and home use will be seriously curtailed if load shedding is necessary as a result of the failure of domestic consumers to economize.

One of the window displays at the Twickenham showrooms of the London & Home Counties J.E.A.

Steel Distribution

Last week Mr. H. A. Marquand, Paymaster-General, outlined to the National Production Advisory Council the revised plans for distribution of steel. In explaining the main objects of the revised scheme he said that they had to get rid of the heavy accumulation of out-of-date orders which had arisen through over-authorization. To do this they proposed to replace the existing " M " form for steel (other than sheets and tinplate) by a new Iron and Steel Authorization, and to provide that as from March 31st next, all the old " M " forms should be cancelled and all orders placed under these forms similarly cancelled unless validated in advance under one of the new authorizations which would be issued early in January.

Original provisions for cancellation of time-expired " M " forms and orders placed under them had been allowed in practice to lapse. To avoid a recurrence of the present confusion, it was essential that the steel coming forward every quarter should be delivered against allocations for that quarter. Where, therefore, a firm's authorization for any quarter could not be matched by orders for steel within that quarter, it would lapse, except where through unforeseen circumstances delivery was delayed, when it could be made in the following quarter, but not thereafter unless revalidated against a current authorization. During the first quarter of 1948 industry would be able to select which orders old, currently placed, or entirely new, it chose to revalidate to use up its allocations. The rest would disappear, and with them the congestion on steelmakers' books. It was proposed as rapidly as practicable to extend the system of bulk authorization and so simplify the operation of the scheme for many firms who at the present got their steel authorizations wholly or mainly from their customers and not direct from a Department. It was proposed to appoint a few travelling officers whose duty would be to watch over and assist industry in operating the scheme.

Battery and Accumulator Tax

An amendment has been made to the Finance Bill by the Chancellor of the Exchequer making traders accountable for tax at the following rates on those electric dry batteries and accumulators which are chargeable with tax:—From November 13th to December 8th, 1947, 50 per cent; on and after December 9th, 1947, 33⅓ per cent.

The effect of this amendment is to apply the reduction from 50 per cent to 33⅓ per cent to batteries and accumulators which are delivered on sale, or appropriated to retail trade or similar purposes, on or after December 9th and to imported goods which are entered with the Customs, or delivered from bonded warehouse for home consumption, on or after that date.

Maintenance Electricians' Pay

National Arbitration Tribunal Award No. 1021 deals with a claim by maintenance electricians employed by Vickers-Armstrongs, Ltd., Weybridge. It was contended that the company had failed to implement Award No. 718 restrospectively from the date of operation, April, 1945, in respect of members of the E.T.U. employed in the Maintenance Department as plain time workers. The Tribunal awarded against the claim.

Post Office Training School

The Automatic School at the Post Office Engineering Department Central Training School, Stone, Staffs, is equipped with representative examples of all the major types of telephone exchange equipment employed by the G.P.O. The General Electric Co., Ltd., has installed the major portion of this equipment. Seven separate automatic exchanges are housed in various buildings. Students will be instructed in the fundamentals of automatic telephony and in the detailed operation of the circuits and apparatus employed. In addition to the automatic equipment, the G.E.C. has also supplied some equipment for the Transmission School, which provides training on carrier equipment and the like.

I.M.E.A. Activities

The Incorporated Municipal Electrical Association announces that the functions at next year's convention at Eastbourne (June 7th to 11th) will be held in the Winter Gardens, Devonshire Park, with the exception of the annual dinner which will be at the Grand Hotel.

At present there appears to be no allocation of material for the manufacture of cooker spares and it has been agreed to send a deputation representing the Association, E.D.A. and the manufacturers, to discuss the subject with the Ministry of Works.

Gauge and Tool Makers

The next quarterly luncheon of the Gauge and Tool Makers' Association will be held during the forthcoming Gauge and Tool Exhibition at the New Hall, Vincent Square, London, from January 26th to February 6th. The luncheon will be held at the Savoy Hotel, London, on February 5th, and [the guest of honour and chief speaker will be Mr. Oliver Lyttelton.

Crofts' Expansion

Crofts (Engineers), Ltd., Empire Works, Thornbury, Bradford, have purchased the whole of the assets of Newton, Bean & Mitchell, Dudley Hill, Bradford, who have been established for over fifty years and specialize in the manufacture and repair of steam engines, condensing plant, compressors, power transmission accessories, etc. The business will be carried on under the same name without interruption and with the same employees and management. Crofts intend, after a complete re-organization and re-equipment of the works, to move certain of their manufactures to Dudley Hill. It is expected that the number of employees, now about fifty, will be increased to 200 in the near future.

Reynolds Light Alloys, Ltd.

On page 818 of our issue of November 28th we stated that Reynolds Tube Co., Ltd., had changed its name to Reynolds Light Alloys, Ltd. Actually the position is that the light alloy side of the business of Reynolds Tube Co., Ltd., has been separated from the steel tube and manipulation side by the formation of a new company under the style of Reynolds Light Alloys, Ltd. Reynolds Tube Co., Ltd., still continues to exist and carries on business

as manufacturers of seamless steel tubes and the manipulation of steel and alloy tubes and extruded sections. Reynolds Light Alloys, Ltd., carries on business as manufacturers of light alloy tubes, bars and extruded sections. The administration of both companies is identical, and the registered offices of both are still at Hay Hall Works, Tyseley, Birmingham.

North-East Coast Contractors' Dinner

Speaking at the recent annual dinner of the Newcastle branch of the Electrical Contractors Association, Lt. Col. E. H. E. Woodward general manager of the North-Eastern Electric Supply Co., Ltd., and a member of the British Electric Authority, said that in a nationalized industry there would be a part for private contractors to play. The Central Authority would be responsible for co-ordination between the different area boards so that some uniformity of practice could be achieved, but they in turn would be subject to directions from the Minister of Fuel and Power.

Richardsons Westgarth War History

Some idea of the immense amount of work involved in the maintenance at sea of ships during the war and the many unusual jobs which were undertaken are given in a publication by Richardsons Westgarth & Co., Ltd., which describes and illustrates some of the work carried out by the company and its associated concerns. In addition to the production and repair of marine engines, water tube boilers and ship welding, the work included the construction of gun turret housings, the machining of parts for Bofors guns, the construction of shell room equipment and some hydraulic machinery for warships.

Trade with Russia

Mr. Harold Wilson, President of the Board of Trade, announced last week that he was leaving immediately for Moscow to initiate a resumption of the trade discussions which were broken off in July. He said he would be accompanied by a number of officials from Government Departments concerned in trade with Russia.

Colloidal Graphite Merger

Acheson Colloids, Ltd., of Great Britain and the Acheson Colloids Corporation of America, have been merged and now come under the joint control of Mr. Howard A. Acheson, son of the founder of the two organizations. The present fusion marks forty years of separate, yet parallel, progress. Acheson Colloids, Ltd. will continue to manufacture and serve the United Kingdom, Europe, the British Commonwealth and certain other territories, while Acheson Colloids Corporation will cover the United States, Canada, Latin American countries, the Orient and wherever the States can effect better contact. Acheson Colloids, Ltd., will continue to be under the joint managership of Messrs. E. G. Clarke and H. Higinbotham, the British directors.

1948 Motor Show

After a lapse of ten years the Society of Motor Manufacturers and Traders proposes to organize a Motor Show and a Commercial Motor Transport Exhibition at Earl's Court in the autumn of 1948.

Crane in Contact with Cable

At Newcastle-on-Tyne on Monday last the jib of a crane handling aluminium-house sections on a housing estate came into contact with a 66-kV line. As a result two men were killed and two others suffered shock and severe burns.

Reports on German Industry

Among the latest reports on German industry, copies of which are obtainable from H.M. Stationery Office, are the following:—B.I.O.S. 1276. "Some Aspects of Electrical Contacting Materials and Phenomena Associated with the Design of Electro-Mechanical Devices used in German Telecommunications Equipment" (4s. 6d.). B.I.O.S. 1570. "Steel Sheathing of Electric Cables by the Hackethal Process" (1s. 6d.). F.I.A.T. 954. "A Highly Sensitive D.C. Controlling and Measuring Device" (7s. 6d.). B.I.O.S. MISC. 42. "Insulated Coating of Electric Motor Coils Developed by Vereingte Lackfabriken" (1s.). F.I.A.T. 887. "Lightweight Electric Light Wiring Devices and Conduit Manufactured by the Germans for Export" (3s. 6d.).

Works Visit

The works of Benjamin Electric, Ltd., was visited by the Parliamentary Secretary to the Board of Trade, Mr. J. Belcher, on December 1st in connection with the national export drive. Mr. Belcher inspected the works where industrial lighting fittings are being manufactured both for overseas markets and for the lighting of essential home industries.

Scottish Engineering Centre

Over 350 prominent industrialists, engineering professors from technical colleges, directors of development associations and representatives of Government departments attended the formal opening of the Engineering Centre, Sauchiehall Street, Glasgow, on December 3rd by Sir James Lithgow, Bt.

In introducing Sir James, Major Jackson Millar said that the ceremony inaugurated something entirely new in the field of engineering. The scheme was of some magnitude and would ultimately cover an area of 100,000 sq ft of permanent exhibition. Only 150 firms were accommodated in the sections now being opened.

Next month the heavy engineering section would be ready, and the electrical section would follow in February.

Sir James Lithgow, in formally declaring the Centre open, said that it would benefit the manufacturers who staged the exhibits and the buyer. Already inquiries have been received from buyers from a number of countries.

Mr. E. Bruce Ball, in responding on behalf of the Engineering Centre, said they were asking exhibitors to bring their displays up to date continuously, so that any appearance of being static would be avoided. Their technical officers could impart information about any type of equipment in the engineering field and the best available sources of supply.

Electronic Instruments Exhibition

In connection with the trade exhibition which is being held at Brettenham House, Lancaster Place, Strand, W.C.2 from January 20th to 31st to introduce the new range of "Cintel" electronic instruments manufactured by Cinema-Television, Ltd., admission will be by ticket only and applications should be addressed to the company at Worsley Bridge Road, Lower Sydenham, London, S.E.26.

"Wireless World" Diary

The *Wireless World* Diary for 1948, now obtainable from Iliffe & Sons, Ltd. (Books Department), Dorset House, Stamford Street, London, S.E.1 (price 3s. 8d., plus postage 1½d.), is bound in imitation leather, and has a week to an opening. There are eighty pages of reference material which contain much useful information for all interested in wireless. This includes a tabular forecast giving the predicted optimum working frequencies for short-wave transmissions throughout the year.

Purchasing Officers' Association

From December 20th next the address of the Purchasing Officers' Association will be 17-18, Henrietta Street, London, W.C.2. The telephone number remains unchanged.

Trade Publications

Grimston Electric Tools, Ltd., Progress Way, Purley Way, Croydon, Surrey.—Catalogue and separate price list of "Electriska" all-geared 1 in. bench, pedestal and column drilling machines.

Metropolitan-Vickers Electrical Co., Ltd., Trafford Park, Manchester, 17.—Series of leaflets on testing instruments, electronic devices and radar for merchant ships.

Linolite, Ltd., 158, Bishopsgate, E.C.2.—A leaflet illustrating and giving dimensions of the company's aluminium buckle cable clips.

Merchant Adventurers, Ltd., 43, Portland Road, London, W.11.—Priced leaflet on fluorescent lighting fittings.

Muirhead & Co., Ltd., Beckenham, Kent.—Loose-leaf and gum-in price list sheets.

Electro Methods, Ltd., 220, The Vale, London, N.W.11.—Priced leaflet on an electronic timer.

Metway, Ltd., King Street, Brighton, 1.—Priced leaflet (OF·7) on conduit fittings and accessories.

Richard Crittall & Co., Ltd., 156, Great Portland Street, London, W.1.—Illustrated brochure (No. 302) on space warming by ceiling fabric, wall panels, pendant fittings, convectors and tubular heaters.

Rich & Pattison (Birmingham), Ltd., 81, Jamaica Row, Birmingham.—Factors' catalogue of cables, conduit, switch and fuse gear, lighting fittings and household appliances.

International Combustion, Ltd., 19, Woburn Place, London, W.C.1.—Leaflets illustrating (M.471) drag scrapers and skip hoists and (M.472) belt conveyors for coal handling.

Calendars, Diaries, etc.

British Timken, Ltd., has sent us a very useful wall calendar with large monthly sheets, which also show the preceding and following months. Each sheet has a coloured picture showing some of the varied uses of the company's tapered roller bearings and axleboxes.

W. & E. Kupfer, Ltd., have sent us a neat pocket diary, bound in navy-blue imitation leather, with one week to an opening.

A picture entitled "The Woodland Pool" from a painting by Sutton Palmer, R.I., adorns the tasteful calendar sent by Linealux, Ltd.

Trade Announcements

The Ray Engineering Co., Ltd., Bristol, announce that their London representative, Mr. W. R. Crawley, finds it impossible to continue to represent them and they have mutually agreed to terminate the agency as from December 31st. Mr. S. C. Lofts, who has been Mr. Crawley's assistant, will become the London representative and his address is: 12, Southcote Road, Tufnell Park, London, N.19 (tel. North 4559).

By arrangement with the W.M. Chace Co. of Detroit, **British Driver Harris Co., Ltd.,** Gaythorn Mill, Albion Street, Manchester, has accepted the European representation for the sale of thermostatic bi-metals and will be in a position to supply not only the strip but also the finished parts to specification.

The Anti-Attrition Metal Co., Ltd., has now established a Midlands sales office at 171, Gravelly Hill, Erdington, Birmingham, 23 (telephone: Erdington 1749) in the charge of Mr. O. King.

Berry Wiggins & Co., Ltd., are removing their head office on December 15th to Field House, Bream's Buildings, Fetter Lane, London, E.C.4. (telephone: Holborn 0941; telegrams: Berriggins, Fleet, London).

Mr. L. T. Griffith has been appointed technical sales representative to **Machine Tool Electrics, Ltd.,** Leigh-on-Sea. He was previously with Allen West & Co., Ltd.

Export Details

Overcoming the Shortage of Skilled Shipping Staff

By John C. Hancock

MANY electrical traders and manufacturers, intending to play their part in the national export drive, are finding a new handicap—a shortage of qualified staff able to undertake the clerical work involved in the shipment of goods overseas. The complex business of shipping goods abroad demands more and more specialized knowledge. Pitfalls, in the shape of consular procedure, customs formalities, export licensing, exchange control and other governmental regulations abound, and non-compliance with the "rules of the game" may easily lead the unwary into costly errors or, at least, occasion serious delays to the shipment of the exporter's goods or hold up the clearance of the necessary shipping documents.

Employment of an Agent

Many electrical concerns, turning to export business for the first time, or faced with the necessity of greatly expanding their existing export trade, may well ask how, without a competent staff, the speedy and efficient shipment of overseas orders can be effected within the compass of their present organizations.

The electrical trader or manufacturer, faced with this problem, would be well advised to place his shipments in the hands of a well-established shipping or forwarding agent. While all the reputable shipping agents have staffs qualified to deal with the intricacies of present-day shipping problems, they are working to capacity. Human nature being what it is, there is a marked tendency nowadays to do the straightforward jobs first and to leave the "sticky" ones until later on. Since the exporter is obliged to supply certain instructions and information necessary to enable the shipping agent to carry out his commission, it cannot be too strongly emphasized that the information rendered should be meticulously correct, because any instruction which is not clear, or any information containing a query, is likely to be put aside until time can be found to straighten it out. By satisfying himself beforehand, by a system of cross-checking if necessary, that his instructions are incapable of misinterpretation, and that the shipping details are correctly set out, it is largely within the power of the exporter to avoid exasperating delays both in the shipment of his goods and to the relative documents.

Probably the most important document of all originating from the exporter's office is the shipping specification. This specification gives birth to the bill of lading. The rate of freight is influenced as much by the way the goods are described in the specification as by what they are. Therefore, such generic terms as "electrical goods" should be avoided as it is often possible, by describing the goods under some other heading, to obtain, quite legitimately, a lower rate of freight. For example, wires and cable, while being electrical goods, are charged at a lower rate of freight if they are given their exact descriptions, though in some instances separate rates obtain for "insulated copper wire" and "electric cable."

Checking Freight Charges

No imputation of dishonesty is levelled at shipping agents in general by pointing out that their remuneration is obtained by levying a percentage of the freight charges on each shipment; the more the freight the greater is the commission earned. Thus, it is always as well for the exporter to obtain from the various freight conferences a list of rates covering the commodities in which he is particularly interested so that a check can be made on the freight account when it is received from the agent. By doing this the exporter will keep the agent "on his toes" so to speak, and at the same time will not need to accept without question any rate which happens to be charged.

Shipping specifications should show clearly the weights and dimensions of each separate package. If time can be spared it is a good plan to work out the cubic capacity of each package as this makes an additional check on the freight, in instances where it is charged on the measurement. Where any consular documents are necessary — most South American countries specialize in this form of inquisition—the shipping specification should also show the net and "legal" weights of each description of goods, in addition to

the gross weights of the packages in which they are made up. Care should be taken that such information is correctly given, as any inaccuracies, even slight ones, may lead to fines and other penalties in the country of destination, and when they occur the consignee is generally not slow to point them out to the shipper.

Licensing Restrictions

Still stressing the need for accuracy, it is essential that the particulars on the shipping specification should in fact agree with goods and packages before they leave the works or warehouse. Should any discrepancies arise it is naturally far easier to adjust them while the goods are still physically in the possession of the exporter than if they are in the hold of the exporting vessel.

If any of the goods are liable to export licensing restrictions, the Board of Trade licence should be sent to the agent along with the shipping specification. The non-presentation of the licence at the time the goods are ready for shipment causes no little dislocation, and may even entail non-shipment of the package concerned. This in turn may involve extra handling and forwarding charges for transferring to another steamer, and perhaps incurring a minimum freight charge when at last it is shipped, to say nothing of the inconvenience caused to the customer, whose credit may have expired during the interval.

The consignee is unable to obtain delivery of the goods unless he is in possession of the supporting documents, such as bills of lading, invoices, and so on. Therefore, it is important that he should receive them, if possible, before the arrival of the goods. To minimize any risk of delay, clear-cut instructions should be given to the agent as to how the bill of lading is to be prepared, and disposed of.

Such details as requesting a "shipped" bill of lading as against a "received for shipment" bill may appear at first sight somewhat trivial. Since a "received for shipment" bill is not generally regarded as evidence of shipment, it may be found that the bill of lading is unacceptable when it comes to passing the documents through the bank. In the event of non-payment of freight the shipping companies have a lien on the goods. Therefore, the bill of lading should be clearly endorsed "freight paid" before it is presented to the bank. Even in the best-regulated establishments the person authorized to sign cheques is not always available at the right moment, nor is it always possible to find the correct amount of cash to pay freight in exchange for the bills of lading. Thus, a great deal of time can be saved if a credit account can be arranged with the agent, so that the bills of lading can be handed over already stamped "freight paid."

If the agent is required to effect marine insurance, full details should be set out, including the value to be declared, and not left to the agent to guess the shipper's requirements. Any special risks attaching to any particular cargo should be noted so that they can be properly covered. Although not always requested by the customer, it is a wise precaution to have at least three copies of the insurance policy, an "original" and "duplicate" to accompany the other documents, and a third for retention on the exporter's files.

Customs Specification

A point not to be overlooked is the customs specification which has to be lodged in respect of each consignment of goods leaving the country, within six days of the final clearance outwards of the exporting ship. Description of the goods according to the headings set out in the official "Export List" is required; from these specifications the overseas trade statistics of the United Kingdom are compiled. If this responsibility is delegated to the agent it should be noted that the value to be declared is the free-on-board value, and that the port of unloading does not necessarily denote the country of final destination, as for example, goods off-loaded at Lourenço Marques in Portuguese East Africa may be destined for Rhodesia or the Union of South Africa.

In any dealings with an agent the trader or manufacturer should realize that the agent is bound by certain professional standards and that any information received by him is treated confidentially. In fact, the agent might almost be said to act as the trader's shipping department. On the other hand, experienced as he may be in his own particular sphere, the shipping agent is not gifted with a kind of sixth sense enabling him to act on his own initiative without receiving lucid instructions from his principal.

The Paris Fair.—The Foire de Paris of 1948 will be held from May 1st to 17th. Particulars of space available can be obtained from Miss Lambert, 14-15, Rugby Chambers, 2, Rugby Street, Holborn, W.C.1.

ELECTRICITY SUPPLY

Progress of Power Station Schemes

Accrington.—PURCHASE OF POWER STATION SITE.—The Corporation has made a compulsory purchase order in respect of the land required for the erection of the new Huncoat power station.

Bangor.—REDUCED CHARGES.—The Electricity Department is to utilize £6,000 of a surplus of £7,500 to reduce charges. Consumers on the domestic two-part tariff will have their fixed charge scaled down, the " unit " charge remaining at ¾d. The lighting flat rate will be reduced from 5½d. to 5d. per kWh, while consumers on the business two-part tariff will have the fixed charge reduced from £6 to £5 per kW per annum for the first 5 kW, and the " unit " charge reduced from ¾d. to ⅝d. Meter rents have also been eliminated for the first meter.

Blackburn.—SUPPLY TO PAPER MILL.—The Corporation is to supply electricity to the Sun Paper Mill, Feniscowles, at a cost of £3,718.

Bolton.—METERS.—The Town Council is seeking permission to borrow £7,000 for electricity meters.

Bradford.—RECORD LOAD.—The biggest load in the history of the undertaking was registered on December 1st. It reached 82,400 kW, including an importation from the grid. The previous highest load was 80,910 kW on December 23rd, 1946.

Brighton.—CONSTRUCTION OF NEW STATION.—To inaugurate the construction of the new power station at Southwick the Mayor (Councillor P. F. Friend-James), with the assistance of Mr. B. Jeal, the oldest employee in the service of the undertaking, recently drove the first pile for the foundations. The station will rest on a " raft " of these piles, the land having been reclaimed from the sea by the ash deposit from the existing station. The ultimate capacity will be 315,000 kW and it is hoped that the first half, costing £8,400,000, will be ready by the winter of 1950. The station has been designed by the borough electrical engineer, Mr. H. Pryce-Jones, who will direct its construction. Following the ceremony a luncheon was held at the Old Ship Hotel when Sir Henry Self, deputy chairman of the British Electricity Authority, praised Brighton for a magnificent era of pioneering enterprise. Others present included Mr. J. N. Waite (Central Electricity Board), Mr. W. N. C. Clinch (former borough electrical engineer of Brighton) and Sir William Halcrow.

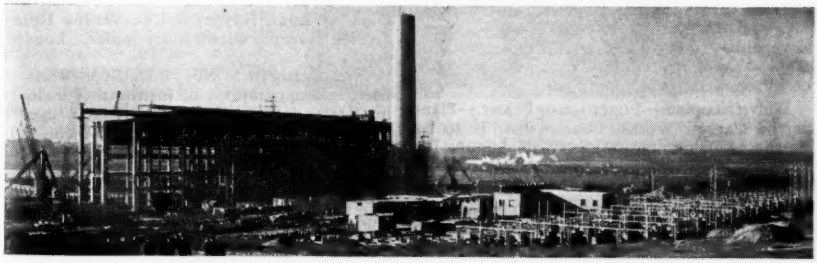
Burnley.—INCREASED CHARGES.—At a meeting of the Town Council on December 3rd, Ald. Busby successfully moved that a minute deferring consideration of increased charges for electricity until February should be altered to December. This was because the Electricity Department made a loss of £24,000 last year. The Mayor said the Electricity Commissioners had stated that the price of electricity could not be increased so long as there was a reserve fund.

Dewsbury.—NEW CABLES.—The Electricity Committee has approved a scheme of the borough electrical engineer for reinforcing the h.v. system to meet the needs of the proposed new housing estate at Thornhill, and for laying cables and services on the estate at an estimated cost of £13,500.

Kettering.—LOAN.—The Town Council is to apply for permission to borrow £26,810 for new feeders to a housing site at Corby and substation, switchgear and cables.

Leamington.—STREET LIGHTING EXPERIMENTS.—The Parade is at present being used for comparing fluorescent lighting with the latest gas methods.

Leeds.—DISTRIBUTION PROJECTS.—Proposals of the Electricity Committee for alterations and additions to the distribution system are estimated to cost £1,564,112. The work includes new



This recent photograph shows the progress which has been made in the construction of the Cliff Quay station of the Ipswich Corporation. It is designed for an initial capacity of 180,000 kW in four sets and an ultimate capacity of 270,000 kW

substations to connect the new Skelton Grange power station to the main system, and a new switch house at Kirkstall. When the Skelton Grange station is in operation the Whitehall Road station will become a distribution centre.

London.—SCHOOL LIGHTING.—The County Council has announced a new programme for the installation of electric lighting at a further eleven schools during 1948-49 at an estimated cost of £28,000.

Lytham St. Annes.—DEARER ELECTRICITY.—The price of electricity has been increased by ¼d. per kWh for flat and prepayment rates for lighting, and by ½d. for domestic power.

Manchester.—WIRING AND EQUIPMENT.—The Health Committee proposes to modernize the wiring system in the main administration block of Langho Colony at an estimated cost of £1,500. Eighteen electric or gas-heated tea urns and twelve refrigerators are to be provided for the wards at Withington Institution, the estimated cost being £3,800.

Plymouth.—STATION EXTENSION LOAN.—The Corporation is to apply for sanction to borrow £795,000 for proposed extensions to the Prince Dock generating station.

Portsmouth.—POWER STATION EXTENSIONS.—The Corporation approved a £1,500,000 scheme for extending the generating station.

Skipton.—ELECTRICITY REFUND.—Mr. W. A. Anderson, chairman of the Electricity Committee, stated on December 1st that Skipton's share of the refund from the Yorkshire Electric Power Co. to supply authorities taking a bulk supply would amount to £6,934.

Turton (Lancs).—INCREASED CHARGES.—The Urban District Council has decided to increase the price of electricity as from January 1st next.

Watford.—SUPPLY TO L.C.C. ESTATE.—The town clerk is to complete the necessary agreement in respect of sites for five substations for the new L.C.C. estate at Oxhey.

Wimbledon. — DISTRIBUTION SYSTEM REINFORCEMENT.—The Electricity Commissioners have approved an expenditure of £76,510 for the reinforcement of the distribution system and preparatory work for initiating a three-phase change-over in certain primary substations.

CONSUMERS' APPARATUS.—The Commissioners have also given consent to the borrowing of £20,000 for electric cookers and £6,000 for other consumers' electrical apparatus.

Wolverhampton.—PURCHASE OF PLANT.—Plant at the Carbon Works, Four Ashes, is to be purchased from the Ministry of Supply for £21,156.

Woolwich.—CHARGES RAISED.—The Borough Council last week approved a recommendation that charges for electricity should be increased by 10 per cent, except to consumers with agreements containing a coal clause. The increase is to take effect from the first full quarter's consumption after January 1st.

F.B.I. Register

THE first post-war edition of the "F.B.I. Register of Manufacturers," the only complete guide to the members of the Federation of British Industries, their products and services, is now available. It lists over 4,500 of the foremost manufacturing organizations in Great Britain, and includes much entirely new information designed to appeal specifically to foreign buyers.

Of particular importance are a Products and Services Section, in which all F.B.I. members are classified under 5,250 headings, facilitating the rapid identification of supply sources; an address section comprising an alphabetical directory giving complete information on every member; and a brands and trade marks section. These are supplemented by additional reference facilities in French and Spanish.

The Register, produced under an arrangement with the Federation of British Industries and published jointly by Kelly's Directories, Ltd., and Iliffe & Sons, Ltd., provides valuable support for the export drive; its world-wide distribution covers the principal buyers, importers and shipping agents throughout the world, British Consuls and Commercial Attachés abroad, Trade Commissioners, Chambers of Commerce, etc. Copies are obtainable at 2 guineas (special terms to F.B.I. members) from Kelly's Directories, Ltd., 186, Strand, London, W.C.2.

Trade Marks

APPLICATION has been made for the registration of the following trade marks. Objections may be entered within one month from December 3rd :—

HEAYBERD (design). No. B.649,694, Class 9. Electrical apparatus included in Class 9.—F. C. Heayberd & Co., Ltd., 28, Russell Square, London, W.C.1.

CIREC. No. 650,263 and (design) No. 650,262, Class 9. Wireless-telegraphic and telephonic apparatus and electronic apparatus included in Class 9.—Channel Islands Radio Engineering Co., Ltd., St. Helier, Jersey. Address for service: c/o Claremont, Haynes & Co., Vernon House, Sicilian Avenue, Bloomsbury Square, London, W.C.1.

C.A. (design). No. B.650,703, Class 9. Electrical apparatus and instruments included in Class 9, all being goods for export. No. B.650,704, Class 11. All goods included in Class 11, all being goods for export.—Clifton Aircraft, Ltd., Arcadia Works, Victoria Street, Lytham.

SAFREEN. No. 651,044, Class 11. Installations for lighting, lighting fittings and electric lamps. DURALITE. No. 651,195, DUROLITE. No. 651,196, and SOLRAY. No. 651,721, Class 11. Fluorescent electric lamps.—Duralite, Ltd., 25, Manchester Square, London, W.1.

Leicester Company's Expansion

Production of Medium-sized Transformers

A CONSIDERABLE expansion of activities is foreshadowed by the recent acquisition by Partridge Wilson & Co., Ltd., Leicester, of a new factory of 20,000 sq ft floor area in Rosebery Street. This No. 2 works, as it is called, will permit the company to extend its range of manufactures to cover much heavier equipment than handled hitherto. Production commenced at the new premises in May and already transformers of up to 150-kVA capacity have been made. Soon units of 200-kVA capacity will be dealt with, while ultimately 500-kVA models will be produced. Improved facilities for making special transformers for plating purposes are provided and apparatus is available for flash tests up to 80,000 V.

Panelling section of the works and (right) core building in the power transformer department

Apart from the larger sizes of transformers, the factory is also being used for making emergency lighting equipment for hospitals, theatres, etc.; and chargers of all types, including improved two-circuit models, special units for bus batteries, portable train lighting battery chargers and railway signalling chargers. The "Fluxomatic" device for giving a constant charging current irrespective of voltage fluctuations is being incorporated to an increasing extent.

One of the most striking things about the new works is the exceptionally spacious and well-laid out paint shop with its excellent natural and fluorescent lighting and attractive colour scheme. Particular attention has been paid to ventilation, while to facilitate handling of the larger apparatus overhead cranes have been provided here as well as in the main assembly bays. One of the latest degreasing plants is also provided. Oil filling of the transformers will be simplified by the completion shortly of a gravity feed system from a 1,500-gal tank, a special feature of which is a flow setting device. As an additional precaution against leaving the oil top open at night a solenoid-actuated safety device is included in the paint-shop fan circuit.

With the transfer of the rectifier and heavier transformer departments to Rosebery Street, the opportunity is being taken to reorganize completely the original factory at Evington Valley Road to accommodate plant from the nearby Institute of the Blind premises utilized since the early part of the war for coil winding and assembly work. All the coil winding as well as the production of transformers up to 3 kVA will in future be undertaken here and the long rows of hand and automatic machines and assembly benches are arranged on mass-production lines, with provision for the introduction of a conveyor system later if considered desirable. A comprehensive vacuum impregnation plant will be situated close to the coil-winding section. The alterations also involve the erection of two more floors on one side of the factory to provide additional office accommodation and space for a canteen.

The No. 3 plant in Old Milton Street, opened during the war, is being retained for small assembly work, and electric vehicle production will continue at Manchester where it was transferred in 1946.

NEW BOOKS

Power Plant Operation. Electroplating Practice.

Power Station Efficiency. By C. W. Priest, B.Sc.(Eng.), M.I.E.E., A.M.I.Mech.E. Pp. 119; figs. 26; index. Sir Isaac Pitman & Sons, Ltd., 39, Parker Street, Kingsway, W.C.2. Price 10s. 6d.

British power station practice is necessarily conservative at present and does not give the engineers any chance of breaking thermal efficiency records. It is, however, a noteworthy fact that the average efficiency of our power stations is almost on a par with those of the U.S.A. where it has been possible to adopt thermal cycles more conducive to high efficiency. The high standard which has been reached in Great Britain is largely due to the efforts of the operating staffs under the direction of the Central Electricity Board.

Individual power stations must vary widely in efficiency because of plant and cycle differences, so the best which can be done by the operators is to endeavour to keep as close to the theoretically obtainable efficiency as coal quality permits. Mr. Priest, an experienced and responsible operating engineer, has indicated, in the book under review, how the problems of attaining and maintaining high efficiency in power stations should be approached. His book is suitable for experienced engineers familiar with power station practice, but with little theoretical knowledge. The method of approach is to indicate the order of efficiency which has been attained and may be reached if technical development proceeds on conventional steam cycle lines.

He is on familiar ground when dealing with the practical aspects of plant operation and with power station thermal accountancy, and provides data which will be useful to recruits in the electricity supply industry. Such recruits, however, will have to seek elsewhere for adequate guidance in thermo-dynamic theory. They may also be puzzled by the personal references in which Callendar, Dalton, Grashof Mollier, Sir Leonard Pearce, J. F. Field and others, appear as stars of the same order of magnitude.

The book is written largely in the jargon current among power station engineers. It is, however, an honest attempt to help in improving the efficiency of production of electricity and deserves a good measure of success.—C.W.M.

Handbook of Industrial Electroplating. By E. A. Ollard and E. B. Smith. Pp. 287; figs. 97; index. *Metal Industry*, The Louis Cassier Co., Ltd., Dorset House, Stamford Street, S.E.1. Price 15s.

The publication of this handbook should be a welcome event to all engaged in the practice of electroplating and to those installing plating equipment. This science has developed enormously in the last ten years and any authoritative book which indicates recent developments is invaluable. By writing a "handbook" instead of attempting a new textbook the authors have chosen the easier course, which has, however, allowed them to publish up-to-date information without the necessity for dealing with theoretical considerations or providing an instruction course for students. Without doubt the authors have succeeded well in their task and have produced a real handbook in its truest sense. For the information it contains, the price is a modest one.

Part 1 deals with electrical equipment, starting with an excellent section on rectifiers; it goes on to consider motor-generators, low-voltage distribution and, finally, the a.c. supply to the plating shop. The information on control panels is well treated and that on a.c. supply gives an overall view of the factors involved. Part 2, on deposition plant, contains, among other things, a useful section on heating of plating tanks. Part 3 gives solution formulæ for the deposition of practically every metal and some alloys and includes formulæ for cleaning, anodizing, colouring and electrolytic polishing solutions. The formulæ in general correspond to good modern practice, but the reader should recall from the preface that "it is not possible for the authors to verify personally all the formulæ, methods and data put forward.

The section on the analysis of plating solutions is good and will guide both highly trained and semi-skilled chemists as to the best methods for plating-shop requirements; but parts of this section are not as clear as they might be. A few obvious methods are omitted while at other times it is difficult to see which are simple methods for the less skilled and which need practised manipulation and sound knowledge of the underlying chemical reactions in order to obtain reasonable results. The final sections cover the testing of deposits, a glossary of electrochemical definitions (B.S.I.) and a long appendix of tables. The testing of deposits is one of the authors' "pet" subjects and is well treated, while the tables, of which there are 68, complete this really useful work.—S.W.B.

Books Received

Radio Engineering. By E. K. Sandeman, Ph.D., B.Sc., A.C.G.I., M.I.E.E. Volume 1. Pp. 775; figs. and index. Chapman & Hall, Ltd., 37, Essex Street, London, W.C.2. Price 45s.

Maintenance Electrician's Handbook. By D. J. Hartshorne. Pp. 136; figs. 85; index. Sir Isaac Pitman & Sons, Ltd., 39, Parker Street, London, W.C.2. Price 8s. 6d.

Iron Simply Explained. By E. N. Simons. Pp. 203; figs. 41; index. Paul Elek, 38, Hatton Garden, London, E.C. Price 12s. 6d.

Three-Phase Complex Power

By D. W. C. Shen, B.Sc.

In a contribution to the* Electrical Review *of February 1st, 1946, the author discussed the complexor representations of electric power in relation to single-phase circuits

IN the case of a balanced Y connection, we have $\dot{E}_{BC} = j\sqrt{3}\,\dot{E}_{OA}$, $\dot{E}_{CA} = j\sqrt{3}\,\dot{E}_{OB}$, $\dot{E}_{AB} = j\sqrt{3}\,\dot{E}_{OC}$ (Fig. 1). The complex powers in the three phases are $\dot{W}_A = \dot{E}_{OA} * \dot{I}_{OA}$, $\dot{W}_B = \dot{E}_{OB} * \dot{I}_{OB}$, $\dot{W}_C = \dot{E}_{OC} * \dot{I}_{OC}$ respectively. To simplify matters, let $a = |120$ deg, $a^2 = |-120$ deg, $= |240$ deg, $a^3 = 1$, then in a balanced three-phase circuit, $\dot{E}_{OB} = a^2\dot{E}_{OA}$, $\dot{E}_{OC} = a\dot{E}_{OA}$, $\dot{E}_{OB}{}^* = (a^2\dot{E}_{OA})^* = a\dot{E}_{OA}{}^*$, $\dot{E}_{OC}{}^* = (a\dot{E}_{OA})^* = a^2\dot{E}_{OA}{}^*$ and $\dot{I}_{OB} = a^2\dot{I}_{OA}$, $\dot{I}_{OC} = a\dot{I}_{OA}$, hence $\dot{W}_B = (a\dot{E}_{OA}{}^*)\,(a^2\dot{I}_{OA}) = \dot{E}_{OA} * \dot{I}_{OA} = \dot{W}_A$; $\dot{W}_C = (a^2\dot{E}_{OA}{}^*)\,(a\dot{I}_{OA}) = \dot{E}_{OA} * \dot{I}_{OA} = \dot{W}_A$, showing that the complex powers in the three phases are equal. Whenever we refer to three-phase power, we mean the total power in the three phases, that is, $\dot{W} = \dot{W}_A + \dot{W}_B + \dot{W}_C = \dot{E}_{OA} * \dot{I}_{OA} + \dot{E}_{OB} * \dot{I}_{OB} + \dot{E}_{OC} * \dot{I}_{OC}$. Obviously, in a balanced circuit, we have $\dot{W} = 3\dot{W}_A = 3\dot{E}_{OA} * \dot{I}_{OA} = 3\,\dfrac{E_{BC}{}^*}{(j\sqrt{3})^*}\,\dot{I}_{OA} = j\sqrt{3}\,\dot{E}_{BC} * \dot{I}_{OA}$. Note the angle between line voltage $\dot{E}_{BC}$ and line current $\dot{I}_{OA}$ is not the power factor angle θ, because there is a j in the expression. The apparent power is $|\dot{W}| = \sqrt{3}\,E_{BC}\,I_{OA}$; the active power and reactive power are easily shown to be $P = \sqrt{3}\,E_{BC}\,I_{OA}\cos\theta$ and $Q = \sqrt{3}\,E_{BC}\,I_{OA}\sin\theta$ respectively.

In the case of a balanced Δ connection (Fig. 2), we have $\dot{I}_{OA} = -j\sqrt{3}\dot{I}_{BC}$, $\dot{I}_{OB} = -j\sqrt{3}\,\dot{I}_{CA}$, $\dot{I}_{OC} = -j\sqrt{3}\,\dot{I}_{AB}$. The complex powers in the three phases are $\dot{W}_{BC} = \dot{E}_{BC} * \dot{I}_{BC}$, $\dot{W}_{CA} = \dot{E}_{CA} * \dot{I}_{CA}$ and $\dot{W}_{AB} = \dot{E}_{AB} * \dot{I}_{AB}$, since the circuit is balanced, $\dot{E}_{CA}{}^* = (a^2\dot{E}_{BC})^* = a\dot{E}_{BC}{}^*$, $\dot{E}_{AB}{}^* = (a\dot{E}_{BC})^* = a^2\dot{E}_{BC}{}^*$, $\dot{I}_{CA} = a^2\dot{I}_{BC}$, $\dot{I}_{AB} = a\dot{I}_{BC}$; therefore the complex powers in the three phases are equal, i.e., $\dot{W}_{CA} = (a\dot{E}_{EC}{}^*)\,(a^2\dot{I}_{BC}) = \dot{E}_{BC} * \dot{I}_{BC} = \dot{W}_{BC}$; $\dot{W}_{AB} = (a^2\dot{E}_{BC}{}^*)\,(a\dot{I}_{BC}) = \dot{E}_{BC} * \dot{I}_{BC} = \dot{W}_{EC}$.

The three-phase complex power is $\dot{W} = \dot{W}_{BC} + \dot{W}_{CA} + \dot{W}_{AB} = \dot{E}_{BC} * \dot{I}_{EC} + \dot{E}_{CA} * \dot{I}_{CA} + \dot{E}_{AB} * \dot{I}_{AB}$. Evidently in a balanced circuit, the complex power becomes $\dot{W} = 3\dot{W}_{BC} = 3\,\dot{E}_{BC} * \dot{I}_{BC} = 3\,\dot{E}_{BC} * \left(\dfrac{-1}{j\sqrt{3}}\right)\dot{I}_{OA} = j\sqrt{3}\,\dot{E}_{BC} * \dot{I}_{OA}$, which is the same as in the Y connection. The current relations in the Δ connection are very similar to the voltage relations in the Y connection. According to the principle of duality, Δ is a dual connection of Y.

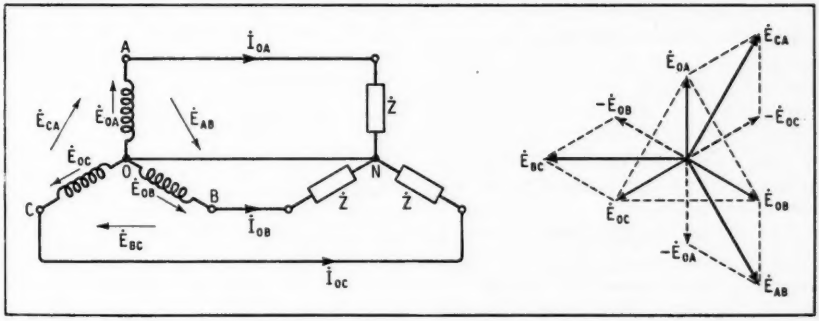


Fig. 1.—Conditions with balanced star connection

It must be pointed out here that the three-phase complex power as given above is conventional and accordingly may be taken as its definition. It is not derived from its instantaneous values, so the corresponding three-phase instantaneous value cannot be

written down as $p = \text{Re}\ \dot{W}\left[1 + \epsilon^{2j(\omega t + \alpha)}\right]$, because the phase voltages differ by 120 deg from each other, whereas in a single-phase circuit the voltage taken as reference is the same throughout. Thus, the instantaneous powers of the three phases are:

$$p_A = \text{Re}\ \dot{W}_A\left[1 + \epsilon^{2j\,(\omega t + \alpha)}\right]$$

$$p_B = \text{Re}\ \dot{W}_B\left[1 + \epsilon^{2j\left(\omega t + \alpha - \frac{2\pi}{3}\right)}\right] = \text{Re}\ \dot{W}_B\left[1 + a\epsilon^{2j\,(\omega t + \alpha)}\right]$$

$$p_C = \text{Re}\ \dot{W}_C\left[1 + \epsilon^{2j\left(\omega t + \alpha + \frac{2\pi}{3}\right)}\right] = \text{Re}\ \dot{W}_C\left[1 + a^2\,\epsilon^{2j\,(\omega t + \alpha)}\right].$$

The average power still equals the active power; that is, $P = \text{Re}\,(\dot{W}_A + \dot{W}_B + \dot{W}_C)$; also the sinusoidal parts of the double-frequency terms constitute a three-phase system. In a balanced circuit, $\dot{W}_A = \dot{W}_B = \dot{W}_C$, the sinusoidal parts of the double-frequency terms are also balanced and its total sum is zero; that is,

$$\text{Re}\,(\dot{W}_A + a\dot{W}_B + a^2\dot{W}_C)\,\epsilon^{2j\,(\omega t + \alpha)} = 0.$$

We may reach this same conclusion either from a Y or Δ connection. There is an important difference between balanced three-phase and single-phase circuits (one of the advantages of three-phase) in that the instantaneous power of a balanced three-phase circuit is constant while that of a single-phase circuit varies. Thus, the three-phase instantaneous power is $p = p_A + p_B + p_C = \text{Re}\,(\dot{W}_A + \dot{W}_B + \dot{W}_C) + \text{Re}\,(\dot{W}_A + a\dot{W}_B + a^2\dot{W}_C)\,\epsilon^{2j\,(\omega t + \alpha)}$. Under balanced conditions, it becomes $p = \text{Re}\,(\dot{W}_A + \dot{W}_B + \dot{W}_C) = 3P_A$ = constant.

In short, though it is quite simple to use the complexor $\dot{W} = \dot{W}_A + \dot{W}_B + \dot{W}_C$ to represent three-phase power, yet its correlation with the instantaneous power should be $(\dot{W}_A + \dot{W}_B + \dot{W}_C) \sim \text{Re}\,[(\dot{W}_A + \dot{W}_B + \dot{W}_C) + (\dot{W}_A + a\dot{W}_B + a^2\dot{W}_C)\,\epsilon^{2j\,(\omega t + \alpha)}]$ and not $(\dot{W}_A + \dot{W}_B + \dot{W}_C) \sim \text{Re}\,(\dot{W}_A + \dot{W}_B + \dot{W}_C)\,[1 + \epsilon^{2j\,(\omega t + \alpha)}]$.

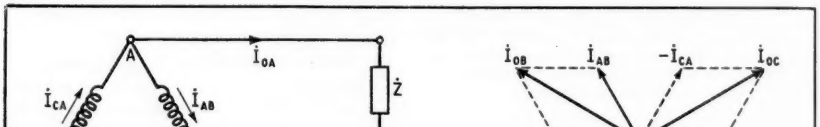


Fig. 2.—Conditions with balanced delta connection

In spite of the constancy of a balanced three-phase power, there still exists the reactive part, but this instead of being an exchange of power between the source and circuit is an exchange of power between the phases and its effect on the source is to increase the amount of current supplied by the source.

Welding Report

THE first interim progress report of Committee F.5, which appears in the December issue of "Welding Research," a supplement to the transactions of the Institute of Welding, is concerned with the measurement of current, pressure and time in resistance welding by means of instruments specially designed for shop use. The object is to enable users more effectively to employ the optimum machine settings now being recommended by the Association for various purposes and materials. For instance it is already possible to pre-set a spot welder in a very short time with such accuracy that the resulting weld strength can be predicted to within 5 per cent.

The development of the instruments has been largely done in the works of different committee members, in which connection the active co-operation of Everett, Edgcumbe & Co., Ltd., Johnson, Matthey & Co., Ltd., and the British Thomson-Houston Co., Ltd., is specially acknowledged.

FINANCIAL SECTION

Company News. Stock Exchange Activities.

Reports and Dividends

The Brush Electrical Engineering Co., Ltd., reports a loss for 1946 of £708,243, and after providing for adjustments for previous years in respect of wartime contracts, less favourable adjustments on civil contracts, and special provisions for turbine reconstruction and maintenance of buildings and plant there is a total debit of £912,292 (against a profit for the previous year of £45,447). After deducting the balance of profit and loss account amounting to £56,744 brought forward from the previous year a debit balance of £855,548 has been carried to the balance sheet. The fixed assets have been professionally revalued and show a substantial appreciation in the value of freehold land and buildings amounting to £686,056, which has been taken to a capital reserve account. To this reserve account has been added the reserve for obsolescence and renewal of plant brought forward from the previous year and the resultant amount of £806,056 has been applied against the loss on profit and loss account, reducing the debit balance to be carried forward on that account to £49,492.

The company states that at the time that the accounts to December 31st, 1946, would ordinarily have been available to the stockholders it was clear that the radical change in the company's trading reserves, as envisaged by the chairman in his speech last year, had taken place and that reasonable profits for 1947 were being earned. The directors felt that it would be in the interests of the stockholders to issue with the accounts the latest available statement of the interim results of trading for 1947, and they therefore decided to issue the 1946 accounts later than usual. Accordingly, on October 5th, the bulk of the stock was physically checked and accounts have been drawn up and audited showing that up to that date a net profit of not less than £200,000 had been earned.

Turner & Newall, Ltd., report that the consolidated trading profits of the company and its subsidiaries (subject to audit) were £5,790,662 for the year ended September 30th last, as compared with £4,149,518 for 1945-46, and after making various provisions and additions there is a balance of £5,119,159 (£3,876,203). The company is paying a final ordinary dividend of 11¼ per cent (against 8¾ per cent), making 15 per cent for the year (against 12½ per cent).

The Plessey Co., Ltd., report net profits for the year to June 30th last, before tax, of £190,126, as compared with £187,175 for the preceding year. The final ordinary dividend is 10 per cent (against 15 per cent), making 20 per cent for the year (against 30 per cent). Tax requires £30,000 and £97,625 is placed to general reserve. The balance carried forward is £72,684 (against £50,013 brought in). The directors also propose the payment of 5 per cent capital distribution, requiring £12,500, not subject to tax, out of capital profits on sales of fixed assets amounting to £80,787, of which £57,809 was received during the year and £22,978 previously. Of this £52,375 is placed to general reserve and £15,912 is carried forward.

Morphy-Richards & Co., Ltd., report a profit for the year to June 30th last of £130,354, as compared with £37,400 for the preceding year. After providing for directors' fees, depreciation, etc., there is a balance of £119,628 (against £30,242). Taxation requires £80,940 and it is proposed to pay an ordinary dividend of 160 per cent (against 20 per cent). The balance carried forward is £21,587 (against £7,357 brought in).

Pinchin, Johnson & Co., Ltd., propose to alter the name of the company to Pinchin, Johnson & Associates, Ltd., and to change their financial year to end on March 31st instead of December 31st.

At an extraordinary meeting to be held on December 16th proposals will be submitted for increasing the capital of the company to £3,300,000 by the creation of 1,000,000 £1 ordinary shares.

Joseph Lucas, Ltd., report a trading profit for the year to July 31st of £335,779, against £364,394 for 1945-46. To this is added £58,482 profit from earlier years. Allocations include £50,000 (same) for obsolescence, £100,000 (same) to reserve and £25,000 (£15,000) to funds for employees. The final ordinary dividend of 15 per cent makes 17½ per cent (15 per cent) for the year and £142,752 (£134,754) is carried forward. A consolidated balance-sheet issued for the first time shows gross profits of £2,382,099 and a consolidated net income of £377,705.

The Hackbridge & Hewittic Electric Co., Ltd., which was made public in March last, has declared an interim ordinary dividend of 4 per cent, less tax. No interim dividend was paid last year but a dividend of 6 per cent, less tax, was paid for the year.

British Transport Stock.—On Tuesday last the British Transport Commission announced that a number of transport stocks (including those of the main-line railway companies and the London Passenger Transport Board) would be "extinguished" on January 1st next and replaced by British Transport Stock in amounts calculated in accordance with rates to be published on January 2nd. Arrangements regarding the final payment of interest or dividend on these stocks were set out and it

was stated that a first payment of six months' interest on British Transport Stock would be made on July 1st, 1948. A list was also published of unvalued securities which remain transferable until further notice.

Stockholders' Representatives

Further appointments of stockholders' representatives under the Electricity Act, 1947, are announced. They include the following:—

MR. W. R. T. WHATMORE, 65, Fenchurch Street, E.C.3.—Bridgwater & District Electric Supply & Traction Co., Ltd.

MR. T. L. C. CLARKE, 44, Thorn Park, Plymouth.—West Devon Electric Supply Co., Ltd.

SIR JOSEPH Nall, National Buildings, St. Mary's Parsonage, Manchester, 3.—Lancashire Electric Power Co., Lancashire Electric Light & Power Co., Ltd., and Ormskirk Electric Supply Co., Ltd.

SIR REGINALD BLAIR, BT., Northmet House, Southgate, N.14.—Northmet Power Co. & North Metropolitan Power Station Co., Ltd.

SIR JOHN MORISON, Granite House, 101, Cannon Street, E.C.4.—Lincolnshire & Central Electric Supply Co., Ltd., and Altrincham Electric Supply, Ltd.

MR. G. BOEX, 241, Salisbury House, London Wall, E.C.2.—Loch Leven Electricity Supply Co., Ltd.

MR. F. V. HUSSEY, 30, Museum Street, Ipswich.—Aldeburgh Electric Supply Co., Ltd.

MR. R. P. BEDDOW, 88, Kingsway, W.C.2.—Electrical Finance & Securities Co., Ltd., Lothians Electric Power Co., and Musselburgh & District Electric Light & Traction Co., Ltd.

MR. L. V. RUSSELL, Abbott's Chambers, 202, Bishopsgate, E.C.2.—Mid-Wales Electric Power Co., Ltd.

New Companies

Robert Bell (St. Andrews), Ltd.—Registered in Edinburgh November 25th. Capital, £6,000. To acquire the business of an electrician carried on at 162, South Street, St. Andrews, by Robert Bell. Directors: R. Bell, T. Dunsire, G. Bruce, J. C. Greig and J. C. Cantley. Regd. office: 115, South Street, St. Andrews.

Allen & Gibson, Ltd.—Registered November 19th. Capital, £2,000. Electrical installation contractors, etc. Directors: L. F. Gibson, 182, Watling Street East, Towcester, Northants, and B. E. Allen, Carlisle House, Towcester.

Lestrix, Ltd.—Registered December 1st. Capital, £5,000. Electrical engineers and general electrical installation contractors, etc. Directors: V. C. Thompson and C. G. Atkinson. Regd. office: 32, St. Stephen's Road, Leicester.

Bolter Electrical, Ltd.—Registered November 29th. Capital, £500. Electrical engineers and contractors, etc. Directors: A. J. Porter and Mrs. Edith R. Porter. Regd. office: 49, Newport Road, Reading.

S. & A. Coache Bros., Ltd.—Registered November 28th. Capital, £1,000. To acquire the business of electrical engineers carried on as S. & A. Coache Bros. Directors: S. H. McCormick and A. L. Coache. Regd. office: 1010, Coventry Road, Hay Mills, Birmingham, 10.

Electrical General Assemblies, Ltd.—Registered November 28th. Capital, £100. Regd. office: Clifford's Inn, Fleet Street, E.C.4.

Petition Dismissed

Tower Electric Co. (London), Ltd.—In the Chancery Division on December 1st Mr. Justice Vaisey had before him a petition for the compulsory winding-up of this company. The petition was dismissed, the company having paid the petitioners' debt.

Winding-up Order

Hume Electric, Ltd.—In the Chancery Division on December 1st Mr. Justice Vaisey made an order for the compulsory winding-up of this company. The petition was based on a judgment debt of £317 and the company did not appear.

Receivership

Dotolite Co., Ltd.—With reference to the notice which appeared in our issue of November 28th, Mr. H. W. Fisher, chartered accountant, informs us that a receiver was appointed for this company on November 5th, 1947, under a mistake of fact by the debenture holder and this was revoked on November 7th, 1947, being the earliest date that the signature to the revocation could be obtained.

Liquidations

Hornsey Engineering & Electrical, Ltd. and **Paxford Electrical, Ltd.**—Meeting of members on January 12th at 14-18, High Holborn, London, W.C.1, to receive an account of the winding-up by the liquidator, Mr. A. L. Westbury. (Members' voluntary winding-up.)

Bankruptcies

A. V. Richardson, carrying on business at 126, Manningham Lane, Bradford, as Market Radio & Electrical Supplies.—Last day for receiving proofs for dividend, December 17th. Trustee, Mr. G. F. Morris, Hallfield Chambers, 71, Manningham Lane, Bradford, Official Receiver.

J. Wilson, carrying on business at 81, Bradford Road, Riddlesden, Keighley, Yorks, electrical engineer.—First and final dividend of 6s. 6d. in the £, payable December 20th at the office of the trustee, Mr. H. Mitchell Firth, Eldon Chambers, 5, Eldon Place, Bradford.

A. J. Harding, carrying on business at 50-51, Broad Street, Hereford, also at West Street, Hereford, electrical engineer.—Supplemental dividend of 1s. 11$\frac{13}{16}$d. in the £, payable December 8th at the office of the Official Receiver, 133, St. Owen Street, Hereford.

STOCKS AND SHARES

JANUARY 1st, 1948, is going to be a day of no little importance for thousands of investors who hold Home Railway stocks, for it has been announced that then the Government will make known its decision as to the terms upon which the new British Transport stock will be issued. The Stock Exchange market in the stock will open on the following day, Friday, January 2nd. Holders of Home electricity supply shares will also await the forthcoming statement with lively interest, although in their case it is probable that no announcement will be made until April 1st.

Confidence in the position of Home Railway stocks—and thence at one remove in electricity supply shares—has been further encouraged by the absence of any sustained recovery in the level of gilt-edged prices, upon which depend the terms of the compensation stock assuming a long-dated compensation stock, expectations are becoming fairly confident, in the circumstances, that it will bear the relatively acceptable rate of 3 per cent interest. A much-discussed possibility is the offer to stockholders of various alternatives, including perhaps a short-dated loan at 2½ per cent. Home Railway prices are better; Southern preferred at 74 and Transport "C" at 63½ show modest gains. A recovery of 30 points lifted British Electric Traction deferred to 1355. Tillings at 70s. 6d. are a florin higher.

The Week's Changes

Electricity supply shares show no noticeable tendency to emulate the upward tendency of Home Railway stocks, despite rising confidence in the position of "nationalization" issues. Industrial markets have displayed comparative indifference to the Government proposals for cutting capital expenditure. Automatic Telephones are, indeed, half-a-crown up on the week, at 64s. 6d. Among the few changes worthy of mention in the electrical equipment market are improvements of 2s. 6d. to 75s., in Johnson & Phillips, and of 5s., to 47s. 6d., in General Cables. Telegraph Constructions have reacted to 51s. 3d., Electric Constructions to 45s., and Reyrolles to 67s. B.I.C. are 39s. 0d., after being 40s. 6d. A. C. Cossors weakened from 18s. 6d. to 16s. 3d. Tube Investments advanced further to 6 15/16. Lancashire Dynamo at 5¼ are up ¼. Elsewhere, Marconi Marines are a good feature at 30s. 6d. Victoria Falls, at 6⅜, have come back 5s.

Brush Electrical

Brush Electrical Engineering 5s. units depreciated from 7s. 3d. to 5s. 6d. on the disclosure, in the preliminary figures, of a big deficit on profit and loss account. The 5½ per cent preference have come down from 21s. 9d. to 17s. 6d. For 1946, a trading loss of £708,000 was augmented by other debits to a total figure of £912,000. The figures relate to the year ended last December. No dividend is being paid this time on the ordinary shares. For 1945, the company paid an interim of 4 per cent, but passed the final with the explanation that profits were still being affected by the problems of conversion from war to peace production. Comment has been raised by the board's decision to write off the bulk of the debit balance from the surplus arising from a revaluation of the fixed assets. The board states that a profit in excess of £200,000 was earned for the nine months up to October this year.

Decca and Plessey

The Decca dividend and results were well up to expectations and had the effect of lifting the 1s. deferred shares by 2s. 6d. to 33s. 9d. At this level, they yield approximately 3⅜ per cent on the dividend, maintained at 112½ per cent. The modesty of the yield is connected, by the market, with the future commercial possibilities of the company's "Navigator" system. Plessey shareholders were warned last May about the possible influence on profits of shortages in the supply of fuel and raw materials. The interim distribution was reduced at that time from 15 to 10 per cent, and the same course has now been taken with the final. The 5s. shares shed 6d., to 23s. 3d., at which they return £4 6s. per cent on the money. An additional 5 per cent tax-free distribution is being made out of capital profits.

British Electric Transformer

Crompton Parkinson hold the whole of the £100,000 ordinary capital of the British Electric Transformer Company, which has recently raised the year's dividend from 50 to 70 per cent. Cromptons acquired this interest on the amalgamation of the transformer business of the two companies fifteen years ago. Profits of the subsidiary for the year ended last September are reported to have risen from £60,000 to £80,000. The balance of the capital consists of £191,000 in 5 per cent preference shares, which are publicly held and quoted at 26s. 3d. Crompton Parkinson's financial year ended on the same date and the results are imminent. The 5s. shares have been a rising market in recent weeks. Now 30s. 6d., they show a £3 14s. per cent yield on last year's 22½ per cent.

Smith & Sons' Results

S. Smith & Sons 7 per cent £1 preferred ordinary have hardened to 70s. since the maintenance of the dividend at 17½ per cent. The 1s. deferred, which are again receiving 37½ per cent, stand at 8s. 6d. Net consolidated profits of the group are shown by the preliminary figures to have expanded by 50 per cent. After payment of the preference dividend, the preferred are entitled to a non-cumulative 7 per cent and to share equally in the surplus with the relatively small amount of deferred capital. Yields work out at 5 per cent on the preferred, and at £4 8s. 3d. on the highly-geared junior shares.

Next Week's Events

Monday, December 15th

BIRMINGHAM.—Birmingham Electric Club. "Economics and Prospects of District Heating," by F. W. Shilstone.

BRISTOL.—Grand Hotel. I.E.E. Western Installations Group. Annual dinner.

LONDON.—Savoy Place, W.C.2, 7 p.m. I.E.E. London Students' Section. "An Introduction to Power Switchgear," by P. W. Castle.

St. Ermin's Hotel, S.W.1, 6 p.m. A.S.E.E. Central London District Branch. "The Gas Cushion Cable," by T. R. P. Harrison.

NEWCASTLE-ON-TYNE.—King's College, 6.15 p.m. I.E.E. North-Eastern Radio and Measurements Group. "The Future Development of A.C. Switchboard Instruments," by H. M. S. Smith.

Tuesday, December 16th

CAMBRIDGE.—Cavendish Laboratory, 8.15 p.m. I.E.E. Cambridge Radio Group. "New Possibilities in Speech Transmission," by Dr. Ing. D. Gabor.

GLASGOW.—Royal Technical College, George Street, 6.30 p.m. I.E.E. Scottish Centre. "Electrical Control of Dangerous Machinery and Processes," by W. Fordham Cooper.

GREENOCK.—"The Lorne," 7.30 p.m. Joint meeting of the Institute of Marine Engineers and the Greenock Association of Engineers and Shipbuilders. "The Use of Electricity at Sea," by C. P. Harrison.

LEEDS.—Great Northern Hotel, 6.30 p.m. I.E.E. North Midland Installations Group. "The High-Pressure Mercury-Vapour Discharge and its Applications," by V. J. Francis and W. R. Stevens.

LONDON.—Lighting Service Bureau, W.C.2, 6.15 p.m. Association of Supervising Electrical Engineers. "British Patent Law and the Importance of Inventions to National Progress," by Dr. A. P. Thurston.

LONDON.—Caxton Hall, Westminster, S.W.1, 7 p.m. E.P.E.A. London Technical Group. "Some Experiences in Power Station Corrosion," by P. Scott and E. W. F. Gillham.

LUTON.—Technical College, Park Square, 7.30 p.m. Luton Electrical Society. Informal meeting. "H.R.C. Fuses and Switchgear Rupturing Capacities," by A. W. Blandford.

MANCHESTER.—Engineers' Club, Albert Square, 6 p.m. I.E.E. North-Western Measurements Group. "Design and Construction of a New Electron Microscope," by M. E. Haine.

Textile Institute, 7 p.m. "Radio Frequency Heating and Infra-Red Drying," by L. L. Preston and Mrs. A. M. Thomas.

Wednesday, December 17th

BRISTOL.—Merchant Venturers' Technical College, 6.30 p.m. I.E.E. Western Transmission Group. "The Development of the Gas-Cushion Cable System for the Highest Voltages," by T. R. P. Harrison.

FARNBOROUGH.—R.A.E. Technical College 6.15 p.m. I.E.E. Southern Centre. "Comparisons between Gas and Electricity on the Basis of Coal Economy," by P. Schiller.

RUGBY.—Corporation Electricity Showroom, 6.45 p.m. Joint meeting of the Rugby Engineering Society and the I.E.E. Rugby Sub-Centre. "Electrical Engineering in Aircraft," by C. G. A. Woodford.

SWANSEA.—The Guildhall, 6 p.m. I.E.E. West Wales (Swansea) Sub-Centre. "The British Grid System in Wartime," by J. Hacking and J. D. Peattie.

Thursday, December 18th

DUBLIN.—Trinity College, 6 p.m. I.E.E. Irish Branch. "Economics of High-Voltage Transmission by Underground Cables," by R. N. Berry.

Friday, December 19th

BATH.—I.E.E. Bristol Students' Section, 7 p.m. "A Visit to A.S.E.A. Works, Sweden," by P. Murdoch.

BRISTOL.—Bristol Electric Club. Annual dinner.

LEICESTER.—I.E.E. East Midland Centre. "Comparisons Between Gas and Electricity on the Basis of Coal Economy," by P. Schiller.

LONDON.—Storey's Gate, St. James's Park, S.W.1, 5.30 p.m. Institution of Mechanical Engineers. James Clayton lecture on "Problems Encountered by R.E.M.E.," by Major-General Sir Bertram Rowcroft.

Faulty Extensions

At an inquest held at Rugeley on a thirteen-month-old child it was stated that the baby had been playing with her three-year-old brother in a room in the corner of which there were an electric fire and an iron. The father said that about a month ago he fixed an extension from the power plug in the skirting board with the idea of fitting two plugs, one to the radio set and the other to the iron. An employee of the Trent Valley and High Peak Electricity Co. said the connection was such that a person touching the iron and fire simultaneously, even when both were switched off, would receive a 230-V shock.

At the inquest on Mrs. Ann Corcoran (50) of Blackley, it was stated that when she picked up the flex of an electric fire she screamed, dropped the flex, and said, "Electricity will be the death of me." Shortly afterwards she picked up the flex a second time and was killed. Her husband said that he had fastened some more wire to the end of the radiator lead so that it would reach the lamp plug. He did not know he had used bell wire, and he had not connected the earth wire.

Verdicts of "Accidental death" were recorded in both cases.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (1*s. each*) *may be obtained from the Patent Office*, 25, *Southampton Buildings, London, W.C.*2.

1939

SOC. D'ETUDES pour Liaisons Téléphoniques et Télégraphiques à Longue Distance.—" Apparatus for stabilizing the output of thermionic valve oscillators." 27302. January 24th, 1939. (594756.)

1941

General Electric Co., Ltd., W. B. H. Lord, L. Rollin, G. M. Tomlin and H. C. Turner.—" Electrical apparatus for the measurement or/and indication of distances." 14704. June 12th, 1941. (Dividend out of 585911.) (594937.)

1942

English Electric Co., Ltd., and R. J. Welsh.—" Control of the injection of fuel into a compression ignition type of internal-combustion engine." 13741. September 30th, 1942. (594817.) " Free piston type internal-combustion compressors." 13742 and 14307. September 30th and October 12th, 1942. (594757/8.)

1943

English Electric Co., Ltd., and R. J. Welsh.—" Power plant incorporating internal-combustion engine-driven compressors supplying motive fluid to a prime mover." 8652. May 31st, 1943. (594939.)

L. A. Moxon and C. S. Wright.—" Wireless receiving systems." 11198. July 9th, 1943. (594940.)

1944

Marconi's Wireless Telegraph Co., Ltd.—" Voltage transformer." 2029. February 3rd, 1943. (594763.) " Radio distance measuring apparatus." 3229. July 31st, 1942. (594765.) " Frequency modulated radio altimeter or distance indicator." 3414. June 4th, 1942. (594766.) " Photo-electric device." 4770. March 26th, 1942. (594945.) " Radio direction finding system." 8599. September 30th, 1942. (594819.) " Radio receiver systems." 13658. October 10th, 1942. (594774.) " Tuning apparatus suitable for use in radio and analogous systems." 14634. February 1st, 1943. (594952.) " Radio position finding." 18417. November 2nd, 1942. (594887.) " Tuned electrical circuits." 20005. August 26th, 1941. (594701.) " Radio direction finding." 21300. May 31st, 1943. (594704.) " Electric wave filters." 24689. October 11th, 1943. (594709.) " Pulse radio direction finder system." 26151. December 30th, 1943. (594710.)

English Electric Co., Ltd., and R. J. Welsh.—" Free piston type internal-combustion compressors." 2595. February 11th, 1944. (594764.)

British Thomson-Houston Co., Ltd.—" Frequency-modulation receivers." 7770. April 27th, 1943. (594769.)

A. H. Stevens (Martin Bros. Electric Co.).—" Electric motors of the oscillating armature type." 7899. April 27th, 1944. (594770.)

Standard Telephones & Cables, Ltd.—" Oscillograph apparatus for observing recurring electric pulses." 10104. September 18th, 1942. (594880.) " Pulse generating system." 18953. September 14th, 1942. (594888.)

Standard Telephones & Cables, Ltd., E. C. Lee and J. H. Fearon.—" Manufacture of electric condensers." 11956. June 23rd, 1944. (594772.)

L. Satchwell, W. H. Wilson and A. J. Chinn.—" Thermal regulators for electrical heating apparatus." 14041. July 22nd, 1944. (594775.)

English Electric Co., Ltd., and A. S. Fenemore.—" Means for determining the rate of change of current in a d.c. electric circuit." 14346. July 27th, 1944. (594951.)

L. E. Denton.—" Electric clocks." 16320. October 19th, 1943. (Divided out of 574169.) (594884.)

Metropolitan-Vickers Electrical Co., Ltd., C. H. Last and H. Ferry.—" D.c. electric motor control systems for cranes, hoists and the like." 18073. September 21st, 1944. (Cognate application 2988/45.) (594957.)

Western Electric Co., Inc.—" Asymmetrically conducting electrical devices and methods of making them." 19628. July 28th, 1943. (594959.)

British Thomson-Houston Co., Ltd., and K. R. Hopkirk.—" Windings for dynamo-electric machines." 20476. October 23rd, 1944. (Addition to 534799.) (594778.)

B. Jablonsky.—" Method of and means for heating articles in a high-frequency electric field." 23213. November 22nd, 1944. (Addition to 566927.) (594781.)

General Electric Co., Ltd., and S. K. Lewer.—" Combined inter-communication and radio transmitting circuits." 24105. December 1st, 1944. (594707.)

1945

Standard Telephones & Cables, Ltd., B. B. Jacobsen and W. J. Mitchell.—" Electric wave filters." 40. January 1st, 1945. (594711.)

Marconi's Wireless Telegraph Co., Ltd.—" Cathode-ray tube system." 101. December 31st, 1941. (594712.) " Radio pulse transmission systems." 2159. September 26th, 1942. (594892.) " Pulse signalling system." 8622. August 12th, 1943. (594797.)

Venner Time Switches, Ltd., and W. F.

Horgan.—" Time switches." 768/9 and 771. January 9th, 1945. (594972/3 and 594975.) " Means for operating control elements, such as electric switches, in a selected manner." 770. January 9th, 1945. (594974.)

A. C. Cossor, Ltd., and H. Moss.—" Cathode-ray tubes." 909. January 11th, 1945. (594714.)

A. H. Stevens (Electronic Traps, Inc.).—" Method and means for exterminating animals." 3814. February 15th, 1945. (594894.)

Scophony, Ltd.—" Scanning assemblies." 4415. February 24th, 1944. (594786.)

M. Offner.—" High-frequency diathermy apparatus." 4477. March 6th, 1944. (594895.)

G. W. King, Ltd., and D. M. King.—" Busbars and methods of mounting the same." 4506. February 22nd, 1945. (594896.)

South Wales Switchgear, Ltd., and S. Farrer.—" Electrical circuit breakers." 5252. March 2nd, 1945. (594979.) " Electrical circuit breakers having buffer or damping devices." 8704. April 9th, 1945. (594986.)

Standard Telephones & Cables, Ltd. (International Standard Electric Corporation.—" Telegraph transmission system." 7963. March 29th, 1945. (594795.)

Brush Electrical Engineering Co., Ltd., and C. A. Popham.—" Accumulator charge or specific gravity indicator." 8391. April 5th, 1945. (594723.)

D. E. Bridges.—" Selective circuit arrangements for pulse signalling systems." 8791. April 9th, 1945. (594798.)

British Thomson-Houston Co., Ltd.—" Titanium dioxide dielectric materials." 11663. May 6th, 1944. (594802.) " Electric fuses." 14354. June 9th, 1944. (594736.) " Methods of bending glass tubes and apparatus therefor." 16936. July 8th, 1944. (594911.)

Premier Electric Heaters, Ltd., and A. E. Newton.—" Automatic cut-outs for electrically-heated utensils and appliances." 11968. May 12th, 1945. (594831.)

Standard Telephones & Cables, Ltd., and W. A. Montgomery.—" Electric wave amplifiers for wide frequency bands." 12119. May 14th, 1945. (594803.)

J. G. Bartlett.—" Thermionic voltage regulator." 12948. May 23rd, 1945. (594732.)

Gent & Co., Ltd., and A. T. Oram.—" Electrical time switches." 13156. May 25th, 1945. (594734.)

A. C. Cossor, Ltd., and D. H. J. Rhodes.—" Electrical condensers." 13881. June 2nd, 1945. (594807.)

Humber, Ltd., and A. C. Sampietro.—" Electro-magnetic friction clutch." 15528. June 19th, 1945. (594906.)

Hazeltine Corporation.—" Quick-reset time-delay electronic control system." 16043. August 29th, 1944. (594738.)

First Industrial Corporation.—" Plunger-operated electric switches." 16526. September 25th, 1944. (594740.)

E. K. Cole, Ltd., and J. N. I. Evans.—" Manufacture of fluorescent lamps." 16670. June 30th, 1945. (594741.)

Revo Electric Co., Ltd., and A. E. Felton.—" Mounting for the reflector fitting of tubular fluorescent lamps." 16713. July 2nd, 1945. (594746.)

Harland Engineering Co., Ltd., F. Dutton and J. G. Bowie.—" Spray nozzles for descaling purposes." 16728. July 2nd, 1945. (594751.)

Midland Electric Corporation for Power Distribution, Ltd., L. Arkinstall and R. A. York.—" Apparatus for locating faults in electric cable systems." 16797. July 2nd, 1945. (594846.)

Callender's Cable & Construction Co., Ltd., A. B. F. G. Richardson and H. C. Hall.—" Electric switches adapted to be tripped open." 16798. July 2nd, 1945. (594847.)

T. M. Lewis, E. G. Rounce and A. E. Hills.—" Electrically-driven pumps and compressors." 16810. July 2nd, 1945. (594849.)

Plessey Co., Ltd.—" Electromagnetic vibratory interrupters." 16874. July 3rd, 1944. (594862.)

English Electric Co., Ltd., A. A. Moore, R. L. English and R. P. E. Tabb.—" Actuating mechanism for electric motor speed controllers." 16885. July 3rd, 1945. (594865.)

English Electric Co., Ltd., C. S. Donaldson and E. Jones.—" Sliprings for dynamo electric machines." 16887. July 3rd, 1945. (594866.)

Metropolitan-Vickers Electrical Co., Ltd., and A. Mandl.—" Dynamo-electric machines." 16921. July 3rd, 1945. (594870.)

British Thermostat Co., Ltd., and J. E. Sherlock.—" Thermostatically-operated electrical switching devices." 16926. July 3rd, 1945. (594854.)

British Thomson-Houston Co., Ltd., and J. Moir.—" Thermionic valve amplifiers." 17003. July 4th, 1945. (594919.)

W. T. Henley's Telegraph Works Co., Ltd., Reliance Electrical Wire Co., Ltd., and H. Davis.—" Couplings for electric cables." 17025. July 4th, 1945. (Addition to 547262.) (594922.)

J. Lucas, Ltd., and H. Silman.—" Electric current rectifiers of the selenium type." 17066. July 4th, 1945. (594931.)

British Mechanical Productions, Ltd., and F. C. Fuke.—" Cover-plates for electric switches, socket-outlets and like fixtures." 17077. July 4th, 1945. (594934.)

1946

C. W. Webber.—" Arrangement of electric contacts on a bi-metal thermostat." 5981. February 26th, 1945. (594813.)

1947

British United Shoe Machinery Co., Ltd., (United Shoe Machinery Corporation).—" Machines adapted for seaming together two workpieces by use of a high-frequency electric field." 13870. April 9th, 1945. (Divided out of 594985.) (594993.)

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

Contracts Open

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses.

Australia.—January 21st. N.S.W. Railways. 33-kV switchgear for White Bay power station (Spec. 1182).—*Tenders* (Melbourne).

Bury.—January 5th. Electricity Department. One 40-kV, d.c. testing equipment and one h.v. cable fault localizing bridge. (December 5th.)

Egypt.—Ministry of Public Works. Supply and erection of the main items of mechanical and electrical equipment for the Diesel generating station and water filtration and ice-making plants required for the Aswan Dam Hydro-Electric Scheme. Specifications and conditions of contract may be obtained from the consulting engineers to the Egyptian Government, Kennedy & Donkin. (December 5th.)

Epsom and Ewell.—January 19th. Electricity Department. H.v. and l.v. cable and h.v. switchgear and transformers. (November 28th.)

Inverbervie (Kincardineshire).—December 24th. Town Council. Electric street lighting installation. Burgh surveyor, Viewmount, Stonehaven.

Keighley.—January 12th. Corporation. Fire extinguishing equipment. (See this issue.)

New Zealand.—Hydro-Electric Department. January 20th. E.h.v. control and relay boards (Con. 44-7). January 27th. Transformer banks, one 30,000 kVA, two 10,000 kVA and one 5,000 kVA (Con. 53-6). February 3rd. Grit arrestors (Con. 60). February 10th. Pilot wire transmission line protective relay equipment (Con. 57-9). February 17th. Outdoor switchgear (Con. 63-6). February 24th. Circuit breakers (Con. 67-8).—*Tenders.*

Walsall.—January 2nd. Electricity Department. One 500-kW mercury-arc rectifier, one 550-V d.c. switchboard and one remote supervisory control equipment. (November 28th.)

Warwickshire.—Firms wishing to have their names placed upon a list of approved contractors for heating, laundry and kitchen equipment, electric lighting and power installation and other services should apply to the county architect by February 23rd. (December 5th.)

Orders Placed

Glasgow.—Clyde Navigation Trust. Accepted. Cables and lighting at South Quay, Princes Dock, and at the Graving Dock (£38,500.)—Scottish Cables, Ltd. Electric motors and control gear for caissons at the Graving Dock.—English Electric Co., Ltd.

Manchester.—Electricity Committee. Accepted. Extension of fire extinguishing plant, Stuart Street.—Mather & Platt. Transformers, Carrington power station.—Ferranti. Annual contracts :—Cooker control units. — M.K. Electric. Double-pole switches.—"Diamond H" Switches. Interlocking switch plug sockets. Henley Burrowes & Co. Ironclad combination switches.—Simplex Electric Co.

Contracts in Prospect

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors. It must be borne in mind that many of the projects mentioned may be postponed as a result of the Government's suspension of building activities for the time being.

Barking. Extensions to factory for Adhesive & Allied Products, Ltd., Highbridge Road; F. R. Neville, architect, 20, Cotswold Gardens, Ilford.

Bermondsey.—Rebuilding Block "D" of works; McCorquodale & Co., Ltd., St. Thomas Street, S.E.1.

Birkenhead.—Rebuilding Ocean Flour Mills, Joseph Rank, Ltd.; L. G. Mouchel & Partners, consulting engineers, 38, Victoria Street, London, S.W.1.

Blackpool.—School, Grange Park; A. Hamilton, borough surveyor, Municipal Buildings.

Bootle.—Rebuilding and extensions, Cunard Works, Bankhall Road, A. & S. Henry, Ltd.; A. E. Shennan, architect, North House, 17, North John Street, Liverpool.

Bournemouth.—Two blocks of offices, shops and flats, Terrace Road; B. H. T. Rodd, architect, Hampshire House, The Square.

Dartford.—Tuberculosis dispensary at County Hospital, including X-ray equipment and processing plant; Kent county architect, Springfield, Maidstone.

Falmouth.—Traditional houses (53), Penwerris; borough engineer, Municipal Buildings.

Greenwich.—Showrooms and offices, Stockwell Street; R. D. Wood, 1, Ascot Parade, Clapham Park Road, S.W.4.

Haydock.—School, Piele Road; Wm. Ellis & Sons, Barclays Bank Chambers, Hardshaw Street, St. Helens.

Hornchurch.—Additions and alterations to St. George's Hospital (£28,000); county architect, Chelmsford.

Hull.—Secondary school; A. Rankine, city architect, Guildhall.

Ilford.—Building for nurses, King George Hospital (£11,751); J. & R. Rooff, Crown Works, Boundary Road, E.13.

Factory, Chadwell Heath Lane; R. H. Sear & Co., Ltd., Beehive Lane.

Lancaster.—Houses (100), Hala estate; John Laing & Son, Ltd., builders, Dalston Road, Carlisle.

Lewisham.—Extensions to works; S. W. Farmer & Sons, Ltd., Courthill Road.

Newcastle (Staffs).—Extensions to foundry, Knotton Road, for Trent Foundries, Ltd.; S. Ellams, builder, 11, Whitehorse Road.

Okehampton.—Secondary school; county architect, Heavitree Road, Exeter.

Oldham.—Factory, Smith Street for Puro Products, Ltd.; L. G. Clegg, architect, 5, Queen Street.

Putney.—Additions to works of Spalding Bros., Ltd., Deodar Road; Chamberlain & Willows, 23, Moorgate, E.C.2.

Pwllheli.—Dry cleaning works, Seiont Mills; J. O. Hughes, Caernarvon.

Raunds.—Extensions to factory for Tebutt & Hall Bros., Coleman Street.

Factory extensions for H. H. Winder, Ltd., Grove Street.

Salford.—Extensions to works, J. W. Jackman & Co., Ltd., Blackfriars Street; W. T. Gunson & Son, 10, Marsden Street.

Southend-on-Sea.—Factory, Sutton Court Road; H. E. Allen & Co., Ltd., 343, Victoria Avenue.

Stockport.—Infants' School, Bridge Hall estate; J. Gerrard & Sons, Ltd., builders, Pendlebury Road, Swinton, Manchester.

Surbiton.—Additional factory building, Oakcroft Road; Hoyt Metal Co., of Gt. Britain, Ltd., 105, Deodar Road, S.W.15.

Tredegar.—Houses (150); U.D.C. surveyor, Council offices, Bedwellty House.

Trentham.—New shaft and electrification of colliery (£2,000,000); Hem Heath Pit; National Coal Board.

Wakefield.—Workshop and garages, Thornhill Street, Beverley Bros. Ltd.; Simpson & Moxon, architects, Southgate.

Wandsworth.—Block of 68 flats, Clapham Crescent housing site; Harold Baily, 31a, John Adam Street, W.C.2.

Wembley.—Hospital, Northwick Park estate; Charing Cross Hospital, London, W.C.2.

Willesden.—War damage reinstatement, etc., at Wykeham Road School (£51,750); borough engineer, Town Hall, Dyne Road, N.W.6.

Wood Green.—Two three-storey blocks of flats at Hollies Street; borough engineer, Town Hall.

Woolwich.—Block of flats, Ogilvy Street; Adie, Button & Partners, 29, Weymouth Street, W.1.

Development in Sydney

PRECARIOUS coal supplies and deterioration of quality were serious problems confronting the Sydney County Council electricity undertaking in 1946. The general manager, Mr. G. S. Boyd, in his report says that for long periods the continuity of operation depended on supplies coming in from day to day. Load shedding was necessary on a number of occasions. From June 22nd to September 12th, 1946, the use of electricity for unessential lighting and heating was prohibited.

Nevertheless, sales of electricity reached the record total of 959·1 million kWh, an increase of 6 per cent on 1945. During the year 3,769 additional consumers were connected, making a total of 282,120. The rate of installation of off-peak water heaters was greater than ever before and efforts to develop this load are being intensified. Difficulty was experienced in obtaining adequate supplies of commercial cooking apparatus, but sales were in excess of any previous year, as also was the case with industrial equipment. On the educational side, a noteworthy event was the completion of the Dover Heights Central Domestic Science School where at least half the apparatus for demonstration is electrically operated.

Power Station Efficiencies

The Council generated 1,139·4 million kWh, mainly at its Bunnerong stations, compared with 1,016·9 million in 1945, an increase of 12 per cent. A total of 748,574 tons of coal was consumed, costing on an average £1 6s. 4d. per ton; in addition 1,059 tons of fuel oil costing £10,892 was burned. Per kWh generated, coal consumption (including equivalent heat in fuel oil) at the "A" and "B" stations was respectively 1·68 lb and 1·21 lb, compared with 1·62 lb and 1·18 lb in the previous year. Thermal efficiencies on kWh sent out were 16·93 and 23·29 per cent (against 17·57 and 24·13 per cent.)

Besides being engaged on work for the new Pyrmont station and additions at Bunnerong, the Construction Branch carried out preliminary investigations into possible sites for a new generating station. At Bunnerong "B" the installation of No. 10 set (50,000 kW) was completed but a fault developed in the h.p. cylinder, necessitating extensive repairs and later the manufacture of a replacement cylinder. For Pyrmont, contracts have been placed for four 50,000-kW sets.

The accounts of the undertaking show a gross revenue of £4,462,956, an increase of £276,225. The average price received per kWh sold was 1·117d., the same as in 1945. Working expenses were up by £315,398 to £2,732,256, but fixed charges were slightly lower and the net result was a profit of £1,775 against a deficit of £12,837 in 1945. A loan of $8,500,000 raised by the Council in New York and immediately oversubscribed is being used to convert an earlier loan, so saving £50,000 annually.